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No. 1

RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The fatty-acid composition of glyceride fractions separated from milk fat, E. L. JACK and J. L. HENDERSON. (Univ. Calif.). (*Jour. Dairy Sci.*, 28 (1945), No. 1, pp. 65-78, illus. 2).—Milk fat, separated into five different fractions by precipitation from a solvent at low temperatures, was analyzed by the ester-fractionation method to determine the amount and distribution of the individual fatty acids. The amounts of each fatty acid present in each fraction and in the milk fat were determined, and are given with corresponding weight and mol percentages.

When the values for the composition of the original milk fat were compared with those obtained by reconstructing milk fat from the increments of the individual fatty acids contained in the fractions, an excellent agreement was observed. These data also compared favorably with those reported by others. The occurrence of small quantities of individual fatty acids was detected with more reliability from the fractions than from the complex entire fat.

The protective action of glucose in bovine plasma against heat coagulation, C. R. HARDT, I. F. HUDDLESON, and C. D. BALL. (Mich. Expt. Sta.). (*Science*, 98 (1943), No. 2544, pp. 309-310, illus 3).—When bovine plasma is heated to a temperature of 65° C., formation of a new protein component can be demonstrated by electrophoretic analysis. The formation of the new component when plasma is heated can be prevented by saturation with glucose.

Report on chlorophyll in plant tissue, E. J. BENNE, D. I. ROSE, and C. L. 'OMAR. (Mich. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 4, pp. 517-526).—The authors describe methods for determining total chlorophyll and the individual components, chlorophyll *a* and chlorophyll *b*, in plant tissue. Concentrations of total chlorophyll are evaluated by means of either a photoelectric colorimeter or a photoelectric spectrophotometer. An instrument of the latter type is required for determining the relative quantities of chlorophyll *a* and chlorophyll *b*. A procedure which makes use of a simple extract of a green plant for calibrating a photoelectric colorimeter for evaluation of total chlorophyll is described. Numerous data supporting the contention that this procedure is superior to one making use of isolated chlorophyll as the calibration standard are given.

Effect of silica on the quantitative reduction of nitrates with Devarda alloy, J. A. BRABSON and J. H. KARCHMER (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945),

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied on request.

No. 1, pp. 142-147).—The authors found that the solution of silica from the glass flask does not interfere with the determination of nitrate nitrogen by current methods. Ammonium nitrogen and nitrate nitrogen can be determined accurately in the same solution by determining the ammonium nitrogen with magnesium oxide according to the official A. O. A. C. procedure and subsequently determining nitrate nitrogen according to the A. O. A. C. modification (E. S. R., 85, p. 5) of the Devarda method; also, the recovery of both ammonium and nitrate nitrogen is complete when analysis is made by Devarda's original method, which specifies an NaOH addition of over five times that prescribed by the A. O. A. C. method. Although the amount of silica dissolved by the high concentration of alkali in the original Devarda method is large, the effect of the silica is overcome by virtue of the high alkalinity.

As a possible explanation for the low results obtained for nitrate nitrogen when the sodium hydroxide prescribed in the Official method for this determination was added to the sample and the ammonium nitrogen was determined prior to the addition of Devarda alloy, the authors point out that in the determination of total nitrogen by the Devarda method, reduction of the nitrate nitrogen begins immediately and is near completion by the time the concentration of the alkali becomes sufficiently high for appreciable attack on the glass flask. When ammonium nitrogen is determined first, however, the Kjeldahl flask is attacked strongly by the alkali, especially in the latter part of the distillation, and the silica content of the alkaline solution becomes sufficient to cause appreciable interference with the reduction of nitrates by the alloy. The authors suggest that silica may form over the surface of the alloy a film which inhibits the reduction of the nitrates but is broken by high alkali concentrations and by rapid rates of heating. The increased surface area resulting from the use of larger amounts of alloy or of smaller particle sizes of alloy apparently diminishes the effect of the film.

Adaptation of the Wagner procedure to the chemical evaluation of fused tricalcium phosphate, W. H. MACINTIRE and G. PALMER. (Tenn. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 1, pp. 158-167).—Introduce 1 gm. of material finer than 80 mesh into a dry 250-cc. "fertilizer" flask and then deliver, by pipette, 100-cc. of 2-percent citric acid. Stopper the flask, insert it into an end-over-end agitator, and agitate 30 min. at ± 25 r. p. m. Pour through a dry filter to clarity, and collect 50 cc. of the filtrate in a dry flask. Introduce 10 cc. of the clear filtrate into a 250 cc. Erlenmeyer; dilute to 60 to 75 cc., with inclusion of 15 gm. of P-free ammonium nitrate. Introduce 5 cc. of ammonium phosphomolybdate reagent slowly and agitate 5 min.; add 50 cc. more of the reagent and agitate continuously 30 min. Collect the precipitate on a pulped pad on a Shimer filter, under light suction, and wash the flask and the filter with six successive streams of CO_2 -free distilled water. Transfer the pad and the precipitate to the precipitation flask and disrupt the mat with a stream of CO_2 -free water to a volume of 75 to 100 cc. Add 1 cc. of a 1-percent alcoholic solution of phenolphthalein and dissolve the precipitate with a 2 cc. excess of NaOH, standardized against Bureau of Standards rock. Back titrate, as in 12 : 22 of the Official Methods of Analysis (E. S. R., 85, p. 5) and report as percent P_2O_5 .

Nutritive evaluation of defluorinated phosphates and other phosphorus supplements.—I, Preparation and properties of the samples, W. L. HILL, D. S. REYNOLDS, S. B. HENDRICKS, and K. D. JACOB. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 1, pp. 105-118).—Of pure compounds prepared and tested in various solvents, the authors describe calcium metaphosphate in two crystalline modifications and in the vitreous form, pyrophosphate in three crystalline modifications, tricalcium phosphate in two crystalline modifications, hydroxylapatite, and silicocarnotite. The crystalline modifications are designated alpha, beta, and gamma, respectively, beginning with the form stable at the melting point. Also

described and tested were 4 laboratory preparations of defluorinated superphosphates, and 16 defluorinated superphosphates prepared by commercial concerns, slags and metaphosphate, bone products and natural phosphates, and superphosphate and dicalcium phosphate.

Citrate-soluble and citric acid-soluble phosphorus, respectively, was determined with the use of the official methods for available phosphorus in fertilizers with such precautions as are necessary when meta- and pyrophosphates are present. Hydrochloric acid-soluble phosphorus was determined by a procedure which involves digesting for 1 hr., with shaking at intervals of 5 min., a 1-gram sample with 100 cc. of 0.4 percent hydrochloric acid at room temperature. With the exception of experiments designed to show the effect of weight of sample on the amount of extracted phosphorus, the extractions were made on 1 gm. of sample per 100 cc. of extracting solution. Numerous data obtained in these solubility trials are tabulated.

Report on iron in plants, E. J. BENNE and A. J. SNYDER. (Mich. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 4, pp. 526-531).—This report presents the results of a collaborative study of the *o*-phenanthroline and thiocyanate colorimetric methods for determining the amount of iron in plant ash. Values for concentrations of iron obtained by these colorimetric procedures are also compared with results by the titanous chloride titrimetric method. It is concluded that the *o*-phenanthroline procedure is more reliable than the thiocyanate procedure and that the titanous chloride method is convenient and accurate if used correctly.

Munson-Walker. reducing values of some of less common sugars and of sodium glucuronate, L. E. WISE and D. C. MCCAMMON (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 1, pp. 167-174, illus. 1).—The usual gravimetric Munson-Walker method was applied to mannose, galactose, xylose, arabinose, fucose, and rhamnose, as well as to sodium glucuronate and to glucurone. Tables for determining these substances accompany this paper. Their use in certain microbiological studies is suggested.

The determination of tannic substances in commercial cocoa powders, W. S. MUELLER and J. W. KUZMESKI. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 27 (1944), No. 11, pp. 897-901).—The authors determined the ferric chloride precipitate of the tanninoids extracted from cocoa powders by boiling them with 50-percent acetic acid in 15 samples, including both Dutch process and unprocessed cocoas. They showed by an examination of the precipitates that this method (Ulrich's) is not an accurate measure of the tanninoid coloring matter of cocoa in that the ash content of the precipitate is high and variable, averaging 13.45 percent and ranging from 11.48 percent to 18.24 percent of the precipitate and consisting mainly of iron and phosphates. The ash content of the precipitate could be reduced somewhat by washing with a mixture of acetic and hydrochloric acids, a reagent which was more effective for this purpose than either acid alone. Following such washing a further improvement in the estimate of the tanninoid content of the cocoa examined could be obtained by correcting for the remaining ash.

The average percentage of ferric chloride precipitate obtained from Dutch cocoas was approximately one-third of the amount obtained from the unprocessed cocoas.

Final report of the sub-committee on the determination of the percentage of fat in buttermilk, skim milk, and whey, H. C. HANSEN, B. E. HORRALL, E. W. BIRD, and C. JENSEN. (Univ. Idaho, Purdue Univ., Iowa State Col., and N. Dak. Agr. Col.). (*Jour. Dairy Sci.*, 28 (1945), No. 4, pp. 325-327).—Selection of a testing method was based chiefly on simplicity and on agreement with the standard method (Mojonnier). In all centrifugal methods for natural buttermilk, skim milk, and whey, as the fat content increased there was a tendency for the fat test to read a higher percentage of the Mojonnier. Testing methods employing amyl alcohol or fusel oil were unsatisfactory, apparently due to variability of the reagents.

While no one testing method agreed perfectly with the Mojonnier, some procedures conformed much better than others. The following tests gave the best results on the products and are recommended by the committee for adoption: (1) American Association for buttermilk and skim milk and for whey from Cheddar, Blue, Edam, and Swiss cheeses; (2) Minnesota (original reagent) for whey from Cheddar, Swiss, Edam, and Cottage cheeses, and (3) Pennsylvania for whey from Cheddar, Blue, and Edam cheeses. Directions for these methods are given in full.

The effect of temperature of reading on the accuracy of the Babcock test for fat in milk, R. JENNESS and E. O. HERREID. (Vt. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 8, pp. 591-595).—An investigation of the fundamental factors underlying the establishment of the proper temperature for reading the Babcock test indicates that a temperature of about 53.5° C., as calculated from the formula,

$$t = \frac{60 D_{60}C + D_{60} - 0.9}{D_{60}C}, \text{ for the fatty materials fulfills, on the average, the}$$

condition that its density be 0.9. In the formula given, t = temperature (° C.) at which density is 0.9, D_{60} = density (gm./ml.) at 60° C., and C = coefficient of expansion (ml./ml./° C.). The required temperature is approximated in tests read after holding the samples for 5 min. in a water bath at 60° as well as in those read directly from the heated electric centrifuge. It is shown that differences in test due to differences in temperature of reading can be accounted for, on the average, by the coefficient of expansion of the column.

The accuracy of the Mojonnier method of fat determination as influenced by variations in the type and quantity of solvents, R. E. MARLAND and I. A. GOULD. (Mich. Expt. Sta.). (*Amer. Butter Rev.*, 6 (1944), No. 7, pp. 222-226).—The object of the authors was to replace, either entirely or in part, the ether and petroleum spirit used in the Mojonnier test with other fat solvents which may, under wartime conditions, be more easily obtainable and less expensive. Substitutions with two proprietary petroleum products having, respectively, boiling points of 33°-35° C., and of 48°-57°, were made. Complete replacement of petroleum spirit by either proprietary solvent may be made without affecting the accuracy of the fat determination. Complete replacement of ethyl ether by solvent A (b. p. 33°-35°) was not found feasible, and its replacement of 25, 40, and 50 percent of ethyl ether decreased the efficiency of fat extraction in comparison to that obtained by the use of ether alone, the decrease varying directly with the percentage replacement. Reduction in the quantity of ethyl ether by 25 and 50 percent also resulted in lower fat tests than obtained by the Mojonnier, although the inefficiency was not so great as was obtained when the same quantity of ethyl ether was used in a mixture with solvent A.

Homogenized milk, evaporated milk, and ice cream were also analyzed by the methods using a proprietary solvent-ether mixture or a reduced quantity of ether as the first extractant. The same tendency as with milk was observed, but the differences between the Mojonnier and the modified methods were greater for these products. Data obtained indicate a possible seasonal variation in the efficiency of the modified methods, the analyses during the summer period agreeing more closely with the Mojonnier results. When the regular Mojonnier procedure was modified by variations in the ethyl ether, the efficiency was improved by increasing the extractions from two to three, by prolongation of the shaking period from 30 to 60 sec., and by warming the sample just prior to testing and adding extra ammonia during the second extraction. Even these treatments did not completely overcome the inefficiency of the methods, however.

The determination of citric acid in milk products by cerate oxidimetry, B. HEINEMANN (*Jour. Dairy Sci.*, 27 (1944), No. 5, pp. 377-383).—The author bases

a method for the determination of citric acid in milk products on the oxidation of this acid separated from interfering substances by precipitation as lead citrate by an excess of 0.1 N perchlorato-cerate in 4 M perchloric acid solution. The excess perchlorato-cerate is titrated with 0.1 N sodium-oxalate in 2 M perchloric acid using nitro-ferroin as an internal indicator. Care to free the citric acid from other organic substances which are also oxidized by the perchlorato-cerate is necessary. The results are slightly higher than those from the pentabromacetone method and can be secured more rapidly.

Lactic acid in dairy products, I, II. (Mich. Expt. Sta.) (*Jour. Dairy Sci.*, 27 (1944), No. 9, pp. 743-767, illus. 2).—These papers deal, respectively, with methods for the determination of lactic acid and with the development of sour flavor as related to lactic acid formation and concomitant changes.

I. *Application of the Hillig method*, I. A. Gould (pp. 743-752).—The author compares results obtained by the established Troy and Sharp method (E. S. R., 77, p. 442) with the more rapid colorimetric procedure of Hillig (E. S. R., 78, p. 447) based upon the ferric chloride color reaction of acid. Slightly modifying the Hillig procedure, the author was able usually to obtain recovery of lactic acid from milk within 1 mg. percent. Freshly drawn milk was found to give values equivalent to 0.9 to 3.0 mg. lactic acid per 100 gm. milk by this method. These values are believed probably to represent the blank for strictly fresh milk rather than lactic acid. The colorimetric method was unaffected by the concentrations of mercuric chloride, formalin, boric acid, and phenol employed in this study; by development of rancidity; or by the addition to the milk of certain concentrations of sodium chloride, sodium citrate, disodium phosphate, sucrose, and ethyl alcohol.

Sodium benzoate markedly increased the lactic acid value and potassium dichromate appeared to have a slight depressing effect. Neutralization appeared slightly to increase the lactic acid values obtained by this method.

II. *Relation to flavor, acidity measurements, bacterial count, and methylene blue reduction*, I. A. Gould and J. M. Jensen (pp. 753-767).—In this work acid-associated flavors were detected at low levels of lactic acid formation. Many samples of milk exhibited such flavor defects at lactic acid increases of 2 to 5 mg. per 100 gm. or less, and practically all samples possessed acid-associated flavors at lactic acid values of 10 mg. per 100 gm. It is believed, however, that the type of flavor, the temperature of incubation, and the type of organisms may somewhat influence these values. Bacterial clump counts, in general, ranged from about 1.5 to 10 millions per cubic centimeter in those samples showing slight acid-associated flavors. The same factors which influence the acid flavor-lactic acid relationship were found also of importance in this connection. The methylene blue reduction time was markedly shortened in all samples of milk showing appreciable increases in lactic acid. A general relationship between the lactic acid increases obtained by the colorimetric lactic acid method and those found by titration was noted. The titration results may vary appreciably from the true lactic acid changes in individual milks, however.

The alkalinity of milk ash and its relation to the detection of neutralizers in dry milks, I, II. R. W. KUNKEL and W. B. COMBS. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 3, pp. 219-226, 227-232).—These two papers report upon natural variation in the milk ash alkalinity as related to variations caused by adding neutralizers.

I. *Dry skim milk*.—The ash alkalinity of unneutralized skim milk was found to vary within a wide range, and to show considerable differences among breeds of cows. Calcium hydroxide, sodium bicarbonate, and sodium sesquicarbonate produce similar increases in the ash alkalinity of skim milk when they are added in proportions sufficient to neutralize equal quantities of acid. The addition of alkaline

compounds to skim milk in quantities sufficient to reduce the titratable acidity as little as 0.01 percent produces measurable increases in the ash alkalinity. Because of the normal variation in the ash alkalinity of unneutralized skim milk, however, it may be possible in some instances to reduce the titratable acidity considerably more than 0.01 percent by the addition of alkaline compounds without causing the alkalinity of the resulting product to appear abnormally high as compared with the range of values obtained on unneutralized skim milk.

II. *Dry buttermilk*.—The ash alkalinity of unneutralized dry sweet cream buttermilk and of commercial samples of dry buttermilk also varies over a wide range. The breed of the cow producing the milk from which the buttermilk is obtained is one factor responsible for this wide range. The addition of alkaline compounds to buttermilk in amounts sufficient to reduce the titratable acidity as little as 0.01 percent produces measurable increases in the ash alkalinity. The addition of neutralizer to cream is as readily detectable in the buttermilk churned from it as is its addition directly to the buttermilk. The method for the detection of neutralizers in dry skim milk appeared equally adaptable to dry buttermilk; but the wide normal range in the alkalinity of milk ash makes the method less sensitive in both applications.

A routine semimicro method for the determination of copper in whole milk powder, S. G. MENEFEE. (Univ. Ill.). (*Jour. Dairy Sci.*, 28 (1945), No. 3, pp. 243-249).—The author details a procedure for dry ashing, solution of the ash, formation of the diethyldithiocarbamate color complex, extraction of this with isoamyl alcohol, and reading of the color intensity in a photoelectric spectrophotometer. Ashing in porcelain dishes contaminated the milk ash with appreciable added quantities of copper, and dishes of a resistant glass were used to avoid this error. The ashing temperature of 500° C. was found not to cause any loss of copper from the samples.

Determination of gelatin in ice cream, D. MITCHELL, E. H. SHAW, JR., and G. G. FRARY (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 1, pp. 97-105).—Silicotungstic acid was found to precipitate an average of 99.1 percent of 22 commercial samples of gelatin. It was superior in completeness of precipitation and flocculency of precipitate to metatungstic acid, metamolybdic acid, phosphotungstic acid, phosphomolybdic acid, arsenotungstic acid, arsenomolybdic acid, and borotungstic acid. Analysis of the 22 commercial gelatins indicated that the average percentage of nitrogen in dry gelatin is 17.78 percent, corresponding to a factor of 5.63. A quantitative procedure for the determination of gelatin in ice cream is based on isoelectric precipitation of casein at pH 4.6, removal of heat-coagulable proteins at pH 6.3, precipitation of residual milk proteins with silver nitrate at pH 6.3, precipitation of gelatin with silicotungstic acid at pH 3.0, and determination of nitrogen in the precipitated gelatin silicotungstate. This method is not applicable in the presence of sodium alginate.

A qualitative test for sodium alginate in ice cream is based on a qualitative test for pentosan (furfural reaction) in the silver alginate precipitate obtained by addition of silver nitrate to casein-free ice cream serum at pH 4.6.

Spectrophotometric procedure for the estimation of vitamin A in oleomargarine, J. B. WILKIE and J. B. DE WITT (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 1, pp. 174-186, illus. 2).—In experiments with a number of commercial margarines, it was found that neither the antimony trichloride method nor the indirect spectrophotometric procedure was universally applicable. A direct spectrophotometric procedure, involving the chromatographic fractionation of the nonsaponifiable extracts, was developed and applied to the routine examination of a variety of commercial oleomargarines. Measures to prevent or to minimize the destruction of vitamin A were introduced, and visual control of the chromatographic separation was made possible by the use of weak ultraviolet light.

Rapid method for determining "crude fiber" in distillers' dried grain. K. WHITEHOUSE, A. ZAROW, and H. SHAY (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 1, pp. 147-152, illus. 2).—The authors propose to replace the acid and alkaline digestions of the Official method (E. S. R., 85, p. 5) by a single digestion with a reagent made up of 500 cc. glacial acetic acid (CH_3COOH), 450 cc. distilled water, 50 cc. HNO_3 (nitric acid sp. gr. 1.42), and 20 gm. trichloroacetic acid (CCl_3COOH). Of this solution, 100 cc. is used for the extraction of exactly 1 gm. of the sample, and the mixture is boiled for 40 min. from the addition of the reagent. The results agree well with those obtained by the Official method.

The authors find that crude fiber determination can be completed by the proposed method in approximately one-half the time required by the Official method; that the probability of error is greatly lessened, since only three transfers are necessary whereas the Official method involves five transfers; that filtration of the residual grain from the digestion is rapidly completed, in no instances requiring longer than 3 min.; that the error in fiber content caused by variation in the time of digestion and in the quantity of heat used is lessened by the use of the proposed method; and that statistical analysis of the data presented shows that the proposed method is a highly reproducible procedure for determining crude fiber content in distillers' dried grain.

Estimation of undecomposed DDT spray deposits on apples from total organic chlorine content. J. E. FAHEY. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 1, pp. 152-158, illus. 1).—The author outlines a technic for recovery of organic chloride spray deposits from apple surfaces by means of an organic solvent, ignition of this solution, and recovery of the chlorine in a form suitable for quantitative estimation by a modification of the Volhard method. It is anticipated that this technic can be used for estimating the amount of DDT (2,2-bis (*p*-chlorophenyl) 1,1,1-trichloroethane) in deposits resulting from sprays applied to apple trees for codling moth control. Results showing the magnitude of deposits of DDT from several spray mixtures applied in the laboratory are given.

Vapor pressure measurements as an index to moisture in dehydrated vegetables. H. FISCHBACH (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 1, pp. 186-191, illus. 2).—Vapor pressure measurements (millimeters of a commercially available oil of low vapor pressure "Octoil" or of mercury) were found to reflect, more accurately than percentage of moisture as determined by a vacuum-oven method, the "state of wetness" of a dried vegetable. A relationship between the moisture content and the vapor pressure of a dried vegetable was found. Within the range covered, vapor pressure measurements were shown to be independent of the particle size of the vegetable.

Quick test for peroxidase aids in dehydration control. E. H. LUCAS and D. L. BAILEY. (Mich. Expt. Sta.). (*Food Indus.*, 17 (1945), No. 2, pp. 138-139, illus. 4).—A rapid and sensitive test makes use of the dye, 2,6-dichlorophenolindophenol, in an equilibrium with ascorbic acid. The new test has higher sensitivity and greater rapidity than has the guaiacol method. The reaction also is more easily observed, since the color developed is a bright blue which contrasts sufficiently to be seen even with deeply colored extracts like those of carrots and beets.

The effects of storage on the chemical composition of some inbred and hybrid strains of sweet corn. D. M. DOTY, G. M. SMITH, J. R. ROACH, and J. T. SULLIVAN. (Coop. U. S. D. A.). (*Indiana Sta. Bul.* 503 (1945), pp. 31, illus. 10).—In 39 inbred and hybrid strains of sweet corn of the crops of 1935, 1936, 1937, and 1938, polysaccharides increased while sucrose and reducing sugars decreased in all strains of green sweet corn stored at 68° F., the rate of this change being usually more rapid during the early part of the storage period. The various inbred lines and hybrids differed markedly in their sugar content at harvest time and the rapidity

with which sugars were changed to polysaccharides during storage at 68°. Strains with high sugar content at harvest and those with slow storage loss showed similar superiority for all years during which they were studied. Golden Bantam strains P14, P51, 51 x 14, 51B, and 8482, Country Gentleman lines FR34, 6355, 7212, and 8111, Narrow Grain Evergreen 1009-8, and Early Evergreen 99 showed definite superiority in some respects over the other strains studied. The condensation of sugars to polysaccharides was more rapid at 68° than at 98° after the very early part of the storage period. The rate of sugar loss during storage for each strain of sweet corn was similar from year to year, which indicates that the internal factors affecting the change from sugars to polysaccharides during storage of sweet corn are controlled in part by the genetic constitution of the plant.

Moisture loss from green sweet corn was more rapid during storage at 98° than at 68°.

The effects of moisture on peanuts and peanut products, J. G. WOODROOF, S. R. CECIL, and H. H. THOMPSON (*Georgia Sta. Bul.* 241 (1945), pp. 23, illus. 11).—Too high moisture may result in more deterioration than rancidity or insect infestation. Freshly harvested peanuts may be dehydrated in air circulating at about 400 ft. per minute and heated to 130° F., in about 8 hr. Extensive tests at 80, 65, and 50 percent relative humidity indicated that storage rooms for peanuts and peanut products should have a relative humidity of about 60 percent. The moisture content of cured peanuts should be held at about 5 percent, that for roasted peanuts at about 1.5 percent, for hard peanut candies at about 2 percent, for soft peanut candies about 5 percent, and peanut flour at 4 percent or lower. Salted peanuts roasted in fresh oil were less subject to high moisture deterioration than those roasted in much-used oil.

The storage of shelled pecans, F. R. BRISON (*Texas Sta. Bul.* 667 (1945), pp. 16).—Shelled pecans may change in flavor, texture, and color while in storage, and also as a result of insect or disease damage. Kernels change in flavor by becoming progressively rancid and by absorbing odors from other products. Studies begun in 1936 indicate that rancidity may be largely prevented by proper storage at low temperature. Changes in texture are caused by absorption of moisture, which causes the kernels to be spongy; or loss of moisture from excessive drying, which causes them to be brittle. Changes in color are caused by rancidity and by exposure to ammonia fumes. Blue mold is likely to develop under storage conditions such that the relative humidity is high, even where the prevailing temperature is about 32° F.

Pecan kernels were found to be best stored in containers that are moistureproof or nearly so. Sealed tin cans of varying sizes, moistureproof Cellophane, and glass jars sealed under vacuum provide satisfactory conditions for storage.

Potato starch production in Idaho, H. BERESFORD and M. J. ASLETT (*Idaho Sta. Bul.* 259 (1945), pp. 19, about 10 illus.).—Preliminary surveys showed a very promising possibility of using the wasted cull potatoes in Idaho for starch manufacture, and on the basis of carlot loadings of potatoes for 1939-40, it was decided that starch plants of 10-ton capacity would be feasible at Twin Falls and Blackfoot, and a 5-ton unit at St. Anthony. The two plants of 10-ton capacity were in operation by November 1, 1941, and the 5-ton plant (later increased to 15-ton capacity) on September 20, 1942. These plants are described and operational problems and costs are discussed.

Vanilla curing, F. E. ARANA (*Puerto Rico Sta. Cir.* 25 (1945), pp. 21+, illus. 9).—The processing of vanilla from the time of harvest to the preparation of vanilla extract is nontechnically described. Critical evaluation of some killing and sweating methods on the basis of experimental work carried out in Puerto Rico indicated that hot-water, freezing, or oven killing are satisfactory and that oven sweating is superior to sun sweating. The beans are dried and then stored for several

months, during which time the characteristic vanilla aroma develops. The circular contains a nomograph by means of which the curer, from the estimated moisture content of fresh beans and the desired moisture content of the cured material, can determine to what weight the fresh beans should be reduced. The chemistry of vanilla curing is summarized briefly, as are also the symptoms of "vanillism," a form of poisoning which sometimes appears in persons who work with vanilla. See also a previous note (E. S. R., 92, p. 212).

AGRICULTURAL METEOROLOGY

The use of Weather Bureau data in ecological studies, J. N. WOLFE. (Ohio State Univ.). *Ohio Jour. Sci.*, 45 (1945), No. 1, pp. 1-12, illus. 4).—This is a review (34 references) and critical discussion of the value to ecological studies of the climatic data usually employed. Meteorological data from Weather Bureau stations have been the basis for the development of climatic concepts and evidence of climatic trends over large biotic areas such as desert, prairie, and forest; these records have been republished extensively by ecologists in conjunction with their studies, but the correlation of biotic phenomena with the climatic data has not usually been explained or demonstrated. There is a wide variation between macroclimates as determined from Weather Bureau data and the actual microclimates to which biotic communities are subjected and by which they are limited. These data are not applicable when explaining such biotic phenomena as growth, reproduction, succession, and death of plants or animals in the various habitats of a region. There appears to be an urgent need for direct measurements of microclimatic phenomena in analyzing many problems of agriculture, forestry, ecology, and conservation. Further advances in a knowledge of microclimates depend on the development of new instruments and methods, the accumulation of precise phenological data in the habitats or fields where the factors are being measured, and the establishment of facilities for a long-time research program.

Blacksburg (Virginia) weather, 1893-1894, R. M. BROWN (*Va. Polytech. Inst. Bul.*, 38 (1945), No. 5, pp. 43).—Analyses of the principal features of the weather of Blacksburg are presented for the period over which continuous records are available.

SOILS—FERTILIZERS

[Soil Survey Reports, 1936, 1937, and 1938 Series] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. [Soil Survey Rpts.]*, Ser. 1936, No. 21, pp. 124+, about 20 illus.; Ser. 1937, No. 15, pp. 94+, about 15 illus.; Ser. 1938, No. 7, pp. 28+, about 15 illus.).—These surveys were made in cooperation with the State experiment stations as respectively noted: 1936, No. 21, Russell County, Va., S. S. Obenshain et al. (*Va. Expt. Sta.*); 1937, No. 15, Calloway County, Ky., W. J. Leighty et al. (*Ky. Sta.*); and 1938, No. 7, Reconnaissance of Linn County, Mo., W. D. Shrader et al. (*Mo. Sta.*).

Mineralogical and chemical studies of the Putnam silt loam soil, E. P. WHITESIDE and C. E. MARSHALL (*Missouri Sta. Res. Bul.* 386 (1944), pp. 48, illus. 9).—The authors point out that "the investigation of soil-forming processes in Missouri must take into account the widespread occurrence of soils having a heavy impervious clay pan." Of these, the Putnam soil was selected as outstanding for the extreme development of this feature of the profile. For a study of the nature and quantity of the clay found at various depths and comparison with the similar Cowden soil in Illinois, it was necessary to devise a new quantitative procedure for the subdivision of clays according to particle size. The fractions obtained were carefully characterized by mineralogical and chemical methods,

The bulletin is in four parts, of which part 1 is a review of the literature (67 references); part 2 contains the field observations and chemical studies of the two soil profiles; part 3 deals with the new method of fractionation of the clays and with its application to the materials obtained from the profiles; and part 4 gives detailed physical and chemical observations on the fractionated clays.

The use of heavy minerals in studies of the origin and development of soils, J. F. HASEMAN and C. E. MARSHALL (*Missouri Sta. Res. Bul.* 387 (1945), pp. 75, illus. 25).—Data from mechanical analysis and from heavy mineral analysis show that the Grundy profile is uniform in origin both geologically and depositionally down to a depth of 69 in. Above 69 in. the profile is of loessial origin. Below this depth an increasing amount of glacial drift contamination was indicated. Horizontal variations in profile development and mineral composition were small when taken over short distances.

A simple method for calculating the changes taking place during profile development, based on zircon or some other resistant mineral as an immobile indicator, was developed. Zircon was found the best indicator, and it was shown that the present-day profile is heavier than the original parent material. This weight increase is attributed partly to organic matter and partly to oxidation and hydration of minerals leading to clay formation. A study of total heavy minerals revealed that mineral break-down was vigorous in the 0- to 22-in. layers, that it fell off with increasing depth down to 42 in., and that it was negligible at greater depths.

A quantitative measure of the clay formed was obtained, together with a partial picture of its movement. The silt fractions from 0.002 mm. up to 0.046 mm. remained almost constant in total amount and showed some evidence of translocation. The coarsest sand present in quantity (0.125-0.046 mm.) was apparently quite immobile and unaffected by weathering. It could, therefore, be used instead of zircon as an indicator of losses and gains. The profile was shown to have a pronounced volume increase in the B horizon and a net volume increase of about 8 percent. The swelling necessary in the B horizon must have been accompanied by microplastic movements. It is emphasized that if profiles examined be taken to an insufficient depth, completely erroneous conclusions may be drawn.

Studies on Solonetz soils of Alberta, J. M. MACGREGOR and F. A. WYATT (*Soil Sci.*, 59 (1945), No. 6, pp. 419-435).—In the Solonetzlike soils found in the Brown and in the Black soil zones of Alberta, the exchange complex of nearly all of the profiles examined contained calcium as the dominant ion, magnesium being appreciably lower. The quantity of sodium usually present in the exchange complex is appreciably smaller than that of either the exchange calcium or the exchange magnesium. This is in general agreement with most of the investigations of solonetzic soils in North America. The content and the relative proportion of sodium in Alberta solonetzic soils are sometimes higher than in adjacent "normal" soils. The solonetzic soils from the Black soil zone used in this investigation contained more sodium than did those of the drier Brown soil zone. Excessive leaching has not taken place in either the Brown or the Black soils. Only 2 of the 19 Brown soil profiles analyzed showed traces of exchange hydrogen, but this feature was slightly more marked in the Black soils. The solonetzic profiles indicate this to a greater extent than do the nonsolonetzic profiles. The remaining horizons of eroded "slick spot" profiles in general contained larger quantities and proportions of sodium than did horizons of noneroded spots. Accumulations of soluble sulfates in the B₂ horizons of the eroded profiles are attributed to the extremely low permeability of the overlying B₁ horizons.

The so-called solonetz soils of Alberta do not belong to the true alkali soils but are alkalinized to a lesser degree. The profile morphology is typically solonetzic but lacks the Solonetz chemical condition. These soils contain insufficient proportions of

exchange sodium to be included in the sodium soils of Gedroiz. Some of the solonetzic soils of the Black soil zone might be included in the sodium soils of de'Sigmond, but in general such soils in Alberta have the chemical composition of the Solonetzlike soils of Glinka and of de'Sigmond.

Selenium in glacial and associated deposits, W. V. SEARIGHT and A. L. MOXON (*South Dakota Sta. Tech. Bul. 5 (1945), pp. 33+*, illus. 8).—A preliminary survey indicated that it would be necessary to consider the geological relationships in a systematic study of the occurrence and distribution of selenium in east-central South Dakota. Field and laboratory investigations indicate that new interpretations of the age and correlations of Pleistocene deposits must be made, a subject which is taken up in considerable detail, including the identification of a drift later than the Iowan and earlier than the Mankato and here named the Arlington drift.

A total of 220 samples of 15 glacial and associated deposits were taken largely from auger borings and analyzed for selenium. These samples represent about 337 ft. of the deposits. Seven samples of bedrock formations were also analyzed. Selenium was found in small quantities in all glacial and associated deposits in northeastern South Dakota and in western Minnesota. The most selenium was found in Arlington loess and loesslike silts in poorly drained locations. Soils developed on the Arlington loess and loesslike silts contain considerably more, mostly about twice as much selenium as the parent material. Considerable selenium appeared in the outcrops of the Mobridge (Interior) member of the Pierre formation, in the glaciated area of South Dakota. Mechanical analyses of a number of samples of Pleistocene deposits showed that the selenium occurs largely in the clay fraction. Selenium is leached from Pleistocene deposits, transported down slope, and deposited at lower levels. Most selenium occurs at or near locations of poor drainage, both surface and subsurface. Maximum concentrations of selenium in poorly drained locations of Pleistocene deposits are comparable with the average of these in Cretaceous deposits of toxic areas. Underground waters and standing water in the Arlington drift area contain selenium, varying in quantity with the topographic position of the water table.

A. racemosus, a selenium indicator plant, grows on Arlington till, De Smet till, and Arlington loess and loesslike silt. Most of the plants contain relatively little selenium, except those growing in poorly drained locations, where the content ranges well into the averages of those in toxic areas on Cretaceous formations.

The localized distribution of selenium in Pleistocene deposits greatly limits the possibility of selenium poisoning of livestock in northeastern South Dakota.

Arsenic content of South Dakota Cretaceous formations, A. L. MOXON, M. V. SEARIGHT, O. R. OLSON and L. L. SIKSON. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 24 (1944), pp. 68-81).—Because of the action of arsenic in counteracting the effect of selenium, the amount of arsenic present in the soil is of importance. In order to compare the amount of arsenic and selenium in the various formations available for incorporation into soils and possible absorption by plants from soils, ratios of selenium to arsenic are presented.

The analyses show that arsenic occurs in all Cretaceous formations and beds sampled; in fact, all samples contained measurable amounts. They seem to indicate that arsenic is distributed more generally and uniformly in the Cretaceous, possibly in all rocks, than selenium. The least amount of arsenic in any sample was 0.2 p. p. m. and the greatest 64.4 p. p. m.

Copper studies with Oregon soils, L. K. WOOD. (Oreg. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 4, pp. 282-291).—The cause of an erratic response to copper sulfate in Oregon with cane fruit was studied in the laboratory and greenhouse for Hammond sand, Olympic silty clay loam, Powell silt loam, and Labish peat soils. It is reported that acid extraction of soils using boiling 1 and 5

N nitric acid established arbitrary boundaries with copper solubility that were reproducible. Acid extraction of the four soils studied indicated that, although the soils differed in total native copper contents and in the amounts extractable by neutral normal ammonium acetate and by different strength boiling nitric acid, the quantity of copper available was sufficient for plant growth. Soil copper exists in an equilibrium between available, slowly available, and extremely slowly available forms. These forms contain sufficient copper for plant needs, hence yield increases may not be obtained from soluble copper additions to the soils studied. Copper fixation absorbed most of the addition whether the soil was subjected to an alternate wetting and drying or to a moist storage.

Oat plants gave little or no response to copper additions, and fixed copper was found not available to growing bean plants. None of the four soils studied responded definitely to copper additions by increased growth, and it is doubtful that use of copper supplements in these soils would prove economical. Erratic response obtained in the field appears to be due to factors other than a deficiency of copper in available forms in the soils studied.

Fluorine-phosphorus relationships in some New York soils, P. J. WESTGATE (In *Cornell University Abstracts of Theses, 1943. Ithaca, N. Y.: Cornell Univ. Press, 1944, pp. 415-417*).—Four types of New York soils—Dutchess silt loam, Vergennes clay, Ontario loam, and Volusia silt loam—were studied to determine the fluorine content and to find if fluorine is responsible for the unavailability of native and added phosphorus in these soils; and to determine if the $F:P_2O_5$ ratios in soils might help to explain the action of phosphate fertilizer application on yields.

There was no significant correlation between the total phosphorus in the soils studied and their response to phosphate fertilization, the response to phosphorus and the amount of fluorine in the soil, nor the response to phosphorus and the $F:P_2O_5$ ratio for these soils. A significant negative correlation of -0.74 was found between the amount of lime added to these soils and their response to phosphate fertilization. The presence of sufficient native fluorine in the soils studied, plus that added in the superphosphate, in the presence of heavy lime applications allows for the possible formation of fluorapatite, an unavailable phosphate, and the resulting lack of response to phosphate fertilization.

Total organic sulfur and humus sulfur of Minnesota soils, C. A. EVANS and C. O. ROSE. (Minn. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 2, pp. 125-137, illus. 1).—Total sulfur, total organic sulfur, the humus fraction of organic sulfur, sulfate sulfur, carbon, and nitrogen were determined on 39 samples of the Podzol, Chernozem, and Black Prairie soils of Minnesota. The term "beta humus" is suggested as the designation for the liquid fraction of the alkali humus extract after flocculation of alpha humus with an acid.

Humus sulfur appeared to be contained in that portion of the organic matter which is in an advanced stage of mineralization. The quantity present seemed to be affected by climatic conditions. Of both humus and total organic sulfur more were found in the Chernozems and the Black Prairie soils than in the Podzols. The organic matter appeared to act as a reservoir for sulfur as well as other mineral nutrients. A direct correlation between the amounts of humus sulfur contents and those of nitrogen and carbon in the soil was found, as well as a direct correlation between the amounts of total organic sulfur and the amounts of nitrogen and carbon. In the Chernozems and Black Prairie soils the correlation was more apparent than in the podzolic soils. It is suggested that the relationship of nitrogen to organic sulfur may be useful as a criterion for the estimation of sulfur deficiency. The quantities of water-soluble sulfur in Minnesota soils was found variable.

Separation and identification of phytin and its derivatives from soils, C. A. BOWER. (Iowa Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 4, pp. 277-285).—In a study

of soil organic phosphorus, surface soils representative of the Prairie (Carrington silt loam), Meadow-soil (Webster loam), and Gray-Brown Podzolic (Fayette silt loam) great soil groups were investigated to determine their contents of phytin and derivatives. Phytin was precipitated as the ferric salt and phytin derivatives as their calcium salts from sodium hydroxide extracts, which contained 89 to 95 percent of the total soil organic phosphorus. The iron and calcium precipitates from the various soils were identified by comparing their inositol:P ratios with the theoretical ratios of phytin and its various derivatives.

Approximately 35 percent of the total organic phosphorus in the NaOH extracts of the Carrington and Webster soils and 26.5 percent of that in the extracts of the Fayette soil occurred as phytin. The phytin derivatives precipitated by calcium from the NaOH extracts of the various soils had an inositol:P ratio corresponding most closely with that of inositol triphosphate, but were probably a mixture of the diphosphate, triphosphate, and tetraphosphate forms, with the triphosphate predominating. The proportions of phytin derivatives isolated from the various soils ranged from 11.4 to 14.1 percent of the total organic phosphorus of the NaOH extracts. An attempt to isolate inositol monophosphate from the various soils by precipitation as the lead salt was unsuccessful. The isolation of considerable quantities of phytin and phytin derivatives from the soils studied indicates that these organic phosphorus compounds constitute an important form of soil organic phosphorus. The isolation of phytin derivatives as well as phytin is evidence of the decomposition of phytin in soils. The decomposition is not very rapid, however, since the percentages of phytin-phosphorus found were much larger than those of phosphorus occurring as phytin derivatives.

Soil-moisture records from burned and unburned plots in certain grazing areas of California. F. J. VEIHMEYER and C. N. JOHNSTON. (Univ. Calif.). (*Amer. Geophys. Union Trans.*, [25] (1944), pt. 1, pp. 72-88, illus. 15).—Soil-moisture conditions in paired plots, one of which was denuded annually by cutting and burning and the other left undisturbed, are presented. Denudation by burning did not prevent the soil from becoming wet throughout its full depth as soon as that in the unburned plots. In most cases the soil was wet earlier in the season in the burned plots than in the unburned ones. Interception of rain by the vegetation on the unburned plots may have been great enough to account for this difference by preventing the water from reaching the soil surface. Water, however, did get into the soil of the burned plots, as the records show, and burning did not delay this process in comparison with the unburned plots. The soil-moisture records indicate that the infiltration capacity of the soils on the burned plots was not impaired. Evaporation and transpiration were sufficient to dry out the soil in the top 6 in. of all of the plots, but below this depth transpiration seemed to determine soil-moisture losses.

The extraction of moisture from the soil seems to depend upon the ability of the species of plants which grow after burning to extend their roots throughout the full depth of soil and upon the persistency of the plants throughout the growing season. In every case in the unburned plots, the moisture content of all of the soil was reduced to the permanent wilting percentage. On the other hand, on those plots where the brush did not sprout and where the grasses grew for a short time early in the season, the soil moisture, except in the surface layer, was not reduced to the permanent wilting percentage. Under such conditions burning will result in the saving of water and, at the same time, in the production of forage. The records indicate that runoff and erosion were not accelerated on the burned plots in the areas where these experiments were conducted. A discussion by P. B. Rowe of the U. S. D. A. Forest Service is included.

Infiltration and runoff during the snow-melting season, with forest-cover, R. E. HORTON (*Amer. Geophys. Union Trans.*, 26 (1945), pt. 1, pp. 59-68, illus 4) — Using data from drainage basins in the Allegheny National Forest near Kane, Pa., this article presents a new method of analysis of rainfall and runoff data which permits surface runoff and ground-water flow to be segregated and infiltration capacity determined during stream rises. The method can be used on areas with or without snow cover. Determination of infiltration capacity during the snow-melting period is pointed out as being the most difficult problem under the proposed method. During snow melt, infiltration took place at rates governed by the rate of supply of rain and melt water, averaging for the entire snow-melting period one-third to one-quarter of the infiltration capacity of the soil. The infiltration capacity under snow cover with unfrozen soil was found to be about 0.05 in. per hour, or 1.20 in. per day. There was no significant difference between infiltration capacity of those areas with different forest-cover densities. Since the infiltration capacity of these areas greatly exceeded the average rate of supply of melt water during the melting period, and the rate of supply of melt water decreased as the forest-cover density increased, it appears that under the conditions of the experiments increased forest-cover may operate to reduce materially runoff intensity during the snow-melting period. The opposite effect can, however, be brought about by the occurrence of a rain on ripe snow in the forest at a time when the snow cover would have disappeared from an open area. On the other hand, snow cover in forest may absorb a rain which would produce heavy runoff from decreased snow cover or bare ground in the open, especially if the soil surface in the open has frozen after the snow disappeared.

The water table, equipotentials, and streamlines in drained land, II, III, E. C. CHILDS (*Soil Sci.*, 59 (1945), Nos. 4, pp. 313-327, illus. 11; 5, pp. 405-415, illus 4) — In two papers presented as a continuance of the author's study of ground-water movements to drains by means of electrical analogues (E. S. R., 90, p. 452), it is found (Paper II) that bore holes may cause appreciable perturbation of the water table and stream picture, particularly at the very point of examination; that lowering the level of water in the drains alters the shape of the water table and lowers its height at the midpoint by an approximately equal amount; that an open ditch is a more efficient drain than the same ditch piped and filled in; and that neglecting the effect of the capillary fringe causes little error in estimating the position of the water table.

The hodograph of a water table at which steady rainfall arrives is shown to be a simple geometrical figure. This is pointed out as the necessary first step in the analytical solution of such drainage problems.

It is further shown (Paper III) that the streamlines above the capillary fringe in soil with sensibly uniform pore sizes are truly vertical, justifying assumptions made in preceding work. Stream pictures obtained by the method of electric analogues show that, in more usual soil types, the streamlines above the capillary fringe do not depart very much from the vertical. Even where the departure is the maximum which can commonly occur in practice, the error introduced into drainage calculations by assuming them to be vertical is not serious, and is, in any event, on the safe side.

A portable runoff measuring device, M. B. RUSSELL. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 8, pp. 589-594, illus. 2). — The sampler described was designed for use on 1/100-acre plots but can be modified to handle runoff from areas of other sizes. It requires an operating head of 2.5 ft., so it is necessary to install the sampler sufficiently far downhill from the lower end of the plot that the runoff which is delivered to the sampler from the concentrator through a 3-in. downspout pipe can be discharged into the sampler from a point 2.5 ft. above

the ground surface. Construction and service requirements are given for the installation. Methods of calculating runoff are presented.

A probe for establishing the position of the water surface in standpipes, M. B. RUSSELL. (Iowa State Col. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 5, p. 408, illus. 1).—The device consists of a graduated copper probe rod, a 45-v. battery, and a milliammeter. Current flows through the circuit only when the tip of the probe is in water. The position of the water surface can be determined to the nearest 0.05 ft. in less than 15 sec.

Persistence of the moisture conserving effect of methylcellulose in soil, I. M. FELBER (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 331-337, illus. 4).—Applications of anhydrous, fibrous methylcellulose were made to soil in tin cans and exposed to weathering over winter. After 7 mo. of exposure, the moisture content of the treated soil in drained cans amounted to 16 percent, while that of the controls was only 5 percent. In cans without drainage, the treated soil exceeded the moisture content of the controls by about 6 percent. Further experiments with these soils were carried out in the greenhouse, and the drainage holes were sealed. All cans were adjusted to 25-percent soil moisture and were planted to cabbage, corn, beans, and tomatoes. The water loss from the treated soil was from 33 to 47 percent less than the control. Plants made a normal, healthy development with only a slight retardation of growth in the treated soil. The results of this simplified method of soil treatment with methylcellulose suggest the possibility of its use in field practice. Other possible utilizations are also suggested.

Range of soil-moisture percentages through which plants undergo permanent wilting in some soils from semiarid irrigated areas, J. R. FURR and J. O. REEVE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 4, pp. 149-170, illus. 6).—The "wilting range of the soil" is referred to as the range of soil-moisture percentages through which plants undergo permanent wilting. A standardized procedure for making wilting-range determinations is described, and the results obtained on about 80 soils are presented. At soil-moisture percentages near or in the wilting range even a low rate of water loss from the plant had an appreciable effect upon the osmotic pressure of the sap and upon the turgor of the plant. A decrease in soil moisture from field capacity to the first permanent wilting point caused, in plants in dry air, an increase of 5 atmospheres (atm.) in the osmotic pressure of the sap and, in plants in humid air, an increase of only 2.5 atm. The changes in osmotic pressure of plants in humid air indicate that the diffusion-pressure deficit of the plant was somewhat less than 9 atm. at the first permanent wilting point and about 22 atm. at the ultimate wilting point.

The proportion of the available moisture in the wilting range is great enough to be of considerable significance in investigations of the effect of soil-moisture shortage on plants. Of the moisture held between the ultimate wilting point and the moisture equivalent, the proportion held within the wilting range of the soils investigated varied from about 11 percent to about 30 percent and averaged about 20 percent. It was found, in agreement with other work, that the ratio of the moisture equivalent to the first permanent wilting point or to the ultimate wilting point is not constant. It was also found that the percentage of soil colloids, which has recently been used as a basis for calculation of the wilting point, would not serve as a reliable basis for calculation of the wilting points of the soils used in this study. In relation to plant behavior, soil moisture may be classified as (1) moisture available for vegetative growth, (2) moisture in the wilting range, and (3) moisture unavailable to plants. In field work the first permanent wilting point and the ultimate wilting point may be used as reference values for estimating respectively (1) the amount of moisture in a soil that is available for vegetative growth and

Theories of base-exchange equilibria, L. E. DAVIS. (Univ. Calif.). (*Soil Sci.*, 59 (1945), No. 5, pp. 379-395).—The author reviews briefly theories of various investigators with respect to base-exchange equilibria, and discusses these topics: Simple statistics of base-exchange equilibria; ions of equal charge (Donnan equilibria and ionic concentrations, Donnan equilibria and ionic activities, and approximate character of base-exchange equations for ions of the same charge); and ions of unequal charge.

The significance of the concept of base-exchange equilibria is critically analyzed. Although the relation between the ions assumed to be on the colloid and those not on the colloid (in the soil solution or in a filtrate) is usually supposed to involve a chemical equilibrium which can be expressed by an equation of the mass-action law type, the author presents evidence to show that "these ideas are incompletely defined and [the] concept of base-exchange equilibrium as a true thermodynamic equilibrium is not entirely valid." Equilibria between colloidal suspensions containing salts of two cations and filtrates obtained from such suspensions are discussed theoretically. The equilibria are shown as Donnan equilibria. The treatment is based upon the application of Boltzmann's principle to equilibria between very small volume elements in the suspension and in the filtrate. The equilibrium relations between the two complete phases are then derived. On theoretical grounds, mass-action law equations for the Donnan equilibria should not yield equilibrium values that are constant when the variables are concentrations, but solely when the variables are activities. These Donnan systems involve true equilibria between two phases, the preparation of which has involved a base exchange. However, these equilibria are not identical with the usual concept of base-exchange equilibria. The author gives reasons for expecting that "equilibrium constants," with approximately constant values, may be found, theoretically, for equations which are formally of the mass-action law type and which express the base-exchange relation between ionic concentrations for ions of the same charge. Four base-exchange equations for the case of ions of unequal charge are discussed. The validity of each equation, as judged by the constancy of the equilibrium constant, varies with concentration of electrolyte and colloid in the suspension. A theoretical explanation of these facts is developed. The significance of this explanation is indicated by calculations based on data presented by various authors.

Base-exchange-pH relationships in semiarid soils, W. T. McGEORGE. (Ariz. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 4, pp. 271-275, illus. 2).—Since adsorbed sodium contributes most to the high pH values in semiarid soils, the investigation was confined to this base.

The pH of the soil was found to increase with increase in the percentage sodium in the complex, the relation between the two values being significant and linear. It was observed further that when the base-adsorbing complex of semiarid soils is completely saturated with sodium, all soils have nearly the same hydrolytic pH at the 1 : 10 soil : water ratio regardless of the milliequivalents adsorption capacity per 100 gm. of soil. When the pH determinations are made on a soil paste, at the moisture equivalent, the pH decreases with increase in adsorbing capacity, and the correlation is highly significant and linear. Adsorbed sodium was increased by treating the soils with solutions of sodium salts in which the pH is increased, but all the sodium-saturated soils, regardless of whether they were saturated at pH 7, 9, or 10, had the same pH value at the 1 : 10 soil : water ratio.

The determination and interpretation of soil pH values, W. T. McGEORGE. (*Arizona Sta. Tech. Bul.* 104 (1944), pp. 367-426, illus. 21).—Calcareous semiarid soils have pH values higher than those of noncalcareous soils, but there was no relation between the percentage of CaCO_3 and the pH in the calcareous soils. Soil pH values were depressed by increasing salinity, but there was no correlation between total salinity and pH values when the analyses of a large number of soils were com-

pared. pH increased with increase in concentration of CO_2 and HCO_3 and decreased with increase in concentration of Cl , SO_4 , and Ca , but there was no correlation between pH and the concentration of Na when the salts were predominantly sodium salts and CO_2 , HCO_3 , Cl , and SO_4 were all present. The total salinity-pH relationship was best demonstrated by centrifugal separation of the soil and water extracts. The pH of the soil-water mixture, the water separate, and the soil paste increased in pH with successive extractions except in the black alkali soils. In these, the pH of the soil paste decreased. By the use of the Hehner method for determining the black alkali content of soils, a correlation between the magnitude of the Hehner value and the pH was shown. The pH value of the soil increased with an increase in the percentage of replaceable sodium in the exchange complex, with the ratio of sodium to the total exchange capacity of the soil, and with dilution, both in the presence and the absence of neutral salts. All sodium-saturated soils, in the absence of neutral salts, had pH values approximately pH 10.0 to 10.2 as determined at a 1 : 10 soil : water ratio. At the moisture equivalent, the pH decreased with increase in replaceable sodium. The adsorbing capacity of the soil was increased by leaching the soil with salt solutions of high pH values but not by salt solutions of pH 8.5 or lower. The base exchange properties and high pH values of sesquihydrates were affected by salinity and dilution. All the soil separates had an adsorption capacity for cations and exhibited high pH values in semiarid soils. The sand particles usually had a pH higher than that of the silt and clay. The pH value of a soil, when determined in the soil paste, agreed closely with the isolydric pH and the pH of exchange neutrality. Variation in absolute weight of soil with constant soil : water ratios materially affected the pH value of a soil suspension in water. For pH determinations where dilute suspensions are used, an absolute weight of 20 gm. of soil should be used for a 1 : 10 soil : water ratio.

The pH values of soils at low moisture contents obtained with 50-percent ethanol or 50-percent methanol at 1 : 1 soil : alcohol ratio agreed very closely with the pH values obtained on the soil pastes.

The pH of soil separates, W. T. McGEORGE. (Ariz. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 5, pp. 375-378).—The author finds that the pH values obtained for the different soil separates at the moisture content represented by the moisture equivalent approximate most closely those existing under field conditions. All soil separates examined showed pH values which closely approached the pH of the soil mass as a whole at this moisture content. The data given show also a close similarity between the pH values of soil separates from different soils, with slight variations from the average when black alkali was present and CaCO_3 was absent. The pH values at the moisture equivalent started low at 20 mesh, increased to a maximum for sand (0.02 to 0.149 mm.), and decreased again for the clay fraction. Hydrolytic alkalinity was greatest for the clay and least for the sand particles. The data indicate that high pH values will be most easily produced in sandy soils under semiarid saline environment. Because of the low potential or hydrolytic alkalinity in such soils, the author holds that their alkalinity should be least injurious to crops and they should be most easily reclaimed. In silty or clay soils, the hydrolytic alkalinity being greater, he believes that the high pH should result in greater toxicity, partly because of greater hydrolytic alkalinity and partly because these soils are more strongly buffered by the greater colloid content. For the same reasons, these soils should be more difficult to reclaim.

Ionic reactions in soils and clay suspensions: The significance of soil filtrates, R. OVERSTREET. (Univ. Calif.). (*Soil Sci.*, 59 (1945), No. 4, pp. 265-270).—The author discusses certain colloid phenomena in terms of the oscillation volume concept, the suspension effect and the contact effect, and conditions for equilibrium between clay suspensions and electrolyte solutions, and concludes, in part, from

such analyses that the contact effect and the suspension effect are at least theoretically to be expected with all clay or soil suspensions. Moreover, because of the inequalities in the chemical potentials of the diffusible ions, an examination of the soil solution in many cases will not give a correct picture of the chemical properties of the corresponding soil suspension. On the basis of what is known of the properties of the ionic double layer and interface potentials in clays, it is believed that these conclusions are particularly applicable to systems in which the free electrolyte concentration is low.

Factors in permeability changes of soils and inert granular material. A. F. PILLSBURY and D. APPELMAN. (Univ. Calif.). (*Soil. Sci.*, 59 (1945), No. 2, pp. 115-123, illus. 6).—The authors find that when water begins to percolate through a previously unsaturated soil, it traps air which it cannot displace. The maximum effect of trapped air appeared to be in pores of intermediate size. This trapped air was removed only by solution in the water percolating through the soil. The ease with which the air was dissolved was found to depend on the capacity of the water to absorb air, on the time of contact of that water with the air, and, more important, with the volume of percolating water passing through per unit volume of trapped air. Percolating waters were found to pass through or around such trapped air, but the coefficient of permeability was greatly depressed thereby. The coefficient increased as air was dissolved, however. In the field, it appears that such air would not be dissolved appreciably by normal rainfall or irrigation. Exceptions would be water-spreading basins, where water completely covers the surface for considerable periods, and the conditions occurring below the surface of ground-water tables. Initial decreases in permeability were associated with the instability of soil under the action of the percolating waters. In Placentia loam topsoil, prior wetness without percolation did not decrease initial permeability but caused permeability to drop more rapidly.

Obtaining soil cores for permeability tests. W. E. GOODE and J. E. CHRISTIANSEN. (U. S. D. A. coop. 12 expt. stas.). (*Agr. Engin.*, 26 (1945), No. 4, pp. 153-155, illus. 4).—To determine the effect of submergence on infiltration rates it was necessary to develop a method whereby undisturbed soil cores could be obtained from the field for permeability tests. The methods and equipment used are described and illustrated. The transparent plastic cylinders developed and used have several advantages, among them the possibility of obtaining tight-fitting cores which eliminate the necessity for sealing. In taking cores in the field in metal cylinders the conclusion that a good core has been obtained is based on circumstantial evidence, but by using the transparent plastic cylinders, the condition of the core is evident as soon as the jacket is removed, and, if defective, it can be discarded at once and another core taken. In the laboratory the rate of saturation of cores in transparent cylinders can be seen and controlled, and during the permeability test the retention or absorption of air, any structural changes, any "blowing out" or channeling around manometer openings, or other phenomena taking place may be observed and recorded.

An accurate method for determining volume of soil clods. J. R. JOHNSTON. (U. S. D. A.). (*Soil Sci.*, 59 (1945), No. 6, pp. 449-452, illus. 1).—The author made the paraffin coating method for determining the volume weight of soil clods more precise by using as the immersion chamber for the coated clod a funnel tube of the type used for Gooch crucibles, connected through its stem by a suitable length of pressure tubing to the tip of a burette. A cork stopper fitting the top of the funnel tube is provided with a glass tube carrying a level mark, a wire basket to hold the clod, and a ring of De Khotinsky cement to insure insertion to the same depth for every measurement. The water level is adjusted to the volume line on the glass tube by opening and closing the stopcock to the burette. A reading on the burette is obtained. The stopcock is opened, and pressure is applied to

the system through the open end of the glass tube. The stopcock is closed after the volume of water forced into the burette is greater than the volume of the soil clod to be introduced into the funnel. The stopper is then removed from the funnel and a soil clod placed in the wire basket. The stopper with soil clod suspended is placed in the funnel, the water level is readjusted to the volume line on the glass tube by opening and closing the stopcock, and a second burette reading is taken. The difference between the first and second readings represents the volume of the soil clod and paraffin coating. The clod having been weighed before and after paraffin immersion, an immersion correction for the volume of the paraffin is made by subtracting 1.11 times the weight of the coating from the volume of the coated clod. Data showing a maximum variation of 0.04 cc. in five measurements on a clod of about 12.5-cc. volume are tabulated. The cylinder method gave volumes of from 11.5 to 13 cc.; the new method from 12.51 to 12.55 cc.

The structure and properties of the natural fat globule "membrane": A historical review with experiments bearing on a physico-chemical explanation, L. S. PALMER (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 27 (1944), No. 6, pp. 471-481, illus. 5).—The author finds that the fat globules in cows' milk are wholly or partially surrounded by a special group of substances the local concentration of which may be due, in part, to their greater capillary activity. The other surface-active substances occurring in major concentration in milk plasma appeared to constitute the outer layers of the fat globule surfaces, if indeed they are normally concentrated there at all. The latter were readily removed when cream was washed by dilution with water. Experimental work done in the author's laboratory, and by numerous other workers cited, points to the importance of the natural "membrane" of the fat globules in creaming, churning, milk flavor (both normal and oxidized), decreased curd tension of natural sweet cream buttermilk, and in determining the desirable whipping qualities of ice cream mixes.

Cup conductance, field and laboratory calibration of tensiometers employing inexpensive porous cups, A. L. KENWORTHY. (Wash. State Col.). (*Soil Sci.*, 59 (1945), No. 5, pp. 397-404, illus. 7).—The cups used in this study were obtained at a catalog price of 16 ct. each. They were 25 mm. in diameter and 76 mm. in height and had a variable wall thickness. The total cost of constructing the tensiometers, not including the mercury, was approximately 50 to 75 ct. The author presents data demonstrating the possibility of using this inexpensive cup on a tensiometer and to illustrate the influence of soil capillary saturation point upon the characteristics of the calibration curve.

A sharp decline in the tension appeared to result when free water occurred in Sagemoor fine sandy loam.

Movement of carbon disulfide vapor in soils as affected by soil type, moisture content, and compaction, H. A. HANNESSON (*Hilgardia [California Sta.]*, 16 (1945), No. 10, pp. 501-510, illus. 1).—Factors affecting the movement of carbon disulfide vapor in soils were studied according to the method devised and reported by Hagan (*E. S. R.*, 86, p. 297). The permeability to carbon disulfide of several soil series and types from widely separated sections of the Sacramento and San Joaquin valleys in California was investigated by this method.

It was found that under most conditions moisture is an important factor in influencing the movement of carbon disulfide vapor in soils. As the moisture content is increased, the permeability of the soil is decreased; a value of nearly zero is reached as the moisture content of the soil approaches its moisture equivalent. Compaction, as in plow sole or plow pan, is very important in controlling the movement of carbon disulfide vapor under field conditions. If moist, such a layer may be almost impermeable to this vapor. In cultivated surface soils, differences between textures are of less significance. The permeabilities of the lower-clay-content soils

Microorganisms and soil aggregation.—I. Origin and nature of some of the aggregating substances, J. P. MARTIN. (Idaho Expt. Sta.). (*Soil Sci.* 59 (1945), No. 2, pp. 163–174).—A fungus belonging to the *Cladosporium* group, and an aerobic bacillus apparently belonging to the *Bacillus subtilis-mesentericus* group, were found to bring about marked aggregation of the silt and clay particles of the soil. As much as 50 percent of the aggregating effect of the fungus was due to substances produced by the cell material and the remainder to the binding influence of the fungus mycelium. The soil bacillus cells, on the other hand, produced 20 percent of the aggregating effect, and substances produced by the cells accounted for 80 percent.

A hemicellulose-like polysaccharide synthesized by the soil bacillus was found to be primarily responsible for the marked aggregating effect. The organism synthesized a polysaccharide and brought about marked soil aggregation when supplied with either organic or inorganic nitrogen and when dextrose, maltose, xylose, arabinose, or sucrose was utilized as energy material. The greatest aggregation and greatest production of polysaccharide occurred with sucrose. The active aggregating material was attacked to a limited extent by fungi, but was readily destroyed by certain bacteria and actinomycetes.

Influence of microorganisms and some organic substances on soil structure, T. M. McCALLA. (U. S. D. A. and Nebr. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 4, pp. 287–297, illus. 2).—Soil-structure stability was determined by the water-drop method, in which a soil lump of approximately 0.15 gm. (air-dry weight) was placed on a 1-mm. mesh screen and subjected to the action of water drops of 4.7 mm. diameter, falling from a height of 30 cm. at a rate of 1 drop per 4.5 sec. The structure was considered destroyed when the aggregate had been broken down and was at the point of being washed through the screen. The results were expressed as drops per 0.1 gm. of soil.

Knox topsoil, containing an accumulation of decomposition products, was found much more resistant to water drops than was Peorian loess, devoid of these products. When wheat straw, sweetclover, or dextrose was added and allowed to decay in Peorian loess, the stability to water drops was increased temporarily, and the number of drops of water per 0.1 gm. of soil required for structure destruction was increased from slightly to manyfold. Many organic substances, dextrose, sucrose, starch, peptone, cellulose, and gum arabic, did not contribute to soil-structure stability, though these substances do furnish energy material for soil micro-organisms which can convert them into products that increase soil-structure stability. Lignin, proteins, oils, fats, waxes, rosin, and paraffin increased the stability of lumps of Peorian loess to water drops. Inorganic salts did not increase the stability. Of several wetting agents added to Peorian loess, one increased stability whereas the others had no effect. They decreased the stability of Marshall topsoil. Some of the strongly absorbed organic substances such as the basic dyes increased slightly the stability of the Peorian loess. Increased structure stability resulting from biological activity was found to be temporary, apparently remaining, however, as long as the stabilizing decomposition products exist. It appeared from these results that any substance decreasing the rate of wetting or the swelling of the soil would increase its structure stability to water drops.

Soil changes as influenced by cropping and fertilizer treatment, L. F. PUHR (*South Dakota Sta. Tech. Bul.* 4 (1945), pp. 13+, illus. 7).—The loss of nitrogen in surface soil of the soil fertility plots on the agronomy farm of the station from 1915 to 1939 was highly significant. The average loss of nitrogen from all plots was 16.9 percent. Nitrogen changes in subsurface soil were small and statistically not significant for the same period. Application of mineral fertilizers including nitrogen did not maintain the soil nitrogen level in the surface soil nor have a pronounced effect on the rate of nitrogen depletion. The surface soil of all plots

which received no phosphorus fertilizer decreased in total phosphorus. Although the loss of total phosphorus from the plots which did not receive phosphorus fertilizer was small and statistically not significant, it showed a trend downward. Plots which received phosphorus fertilizer showed significant gains in total phosphorus in the surface soil. Subsurface soils showed decreases in total phosphorus, but decreases in the subsurface soil were less where phosphorus fertilizer was applied. Surface soils of the plots receiving phosphorus fertilizer were distinctly higher in available phosphorus. The organic matter content of the surface soil of all the plots decreased significantly from 1915 to 1939. The average loss from the surface soil for all plots was 14.92 percent. In general, fertilizer treatment had no significant effect on the changes in the organic matter content of the surface soil. Changes in the organic matter content of the subsurface soil were small and statistically not significant.

Nebraska outstate crops and soils tests: Soil studies for 1944, J. W. FITTS (*Nebraska Sta. Bul. 373 (1945), pp. 12, illus. 2*).—The results presented in this publication cover a progress report of investigations authorized by the Nebraska State Legislature in creating an outstate testing program for agronomic studies. The experiments covered work with commercial fertilizers on corn, sugar beets, and oats; methods of applying commercial fertilizers in irrigation water; soil moisture determinations at planting time; and studies of the movement of water and nitrate during irrigation. Some studies were inaugurated on soil tilth and fertility maintenance; these will be conducted over a period of at least 6 yr.

Nitrogen fertilizers increased the yield of corn significantly in five tests on irrigated land in central Nebraska. In all cases the tests were conducted on fields thought to be deficient in nitrogen as judged by the cropping history and appearance of the crop. Ammonium nitrate, uranion, and ammonium sulfate were equally effective as nitrogen carriers. Larger increases in yields of corn were obtained from applications of nitrogen fertilizers as a side dressing at the last cultivation than from application either at the time of planting or in the bottom of the plow furrow. Ammonium nitrate applied in irrigation water during the first irrigation in all tests but one gave almost as large increases in yield as obtained from a side dressing application at the last cultivation. In all tests on corn 40 lb. of nitrogen was almost as effective as 80 lb. per acre. The application of 80 lb. per acre of nitrogen was the treatment that significantly increased the yield of sugar beets on two fertilizer tests in the Platte Valley. Superphosphate, 45 percent P_2O_5 , significantly increased the yield of oats in a fertilizer test in Pawnee County. Ammonium sulfate was the most effective fertilizer in the test on oats in Holt County. Studies were conducted to determine equipment suitable for mixing soluble nitrogen fertilizers in irrigation water. It was found desirable to apply the nitrogen fertilizer during the last few minutes of the irrigation. At the time of planting the crop variety tests and crops for the fertilizer tests, all fields were found to contain moisture to the field carrying capacity to a depth of 5 ft. or more.

The effect of various factors on the value of rye for green manure, J. F. DAVIS. (Del. Expt. Sta.). (*Jour. Amer. Soc. Agron., 37 (1945), No. 1, pp. 73-76, illus. 1*).—The possibility of low-cost nitrogen fertilizer after the war directs attention to the use of nonlegumes for green manure crops. In order to get more complete information on the value of rye, data are given on the yield of both tops and roots, stage of maturity of the crop, percentage of nitrogen in tops and roots, the effect of an application of chemical nitrogen on the growth and composition of the crop, the ability of the crop to absorb chemical nitrogen and thus prevent leaching of the nitrogen from the soil, and the effect of stage of maturity of the crop on the moisture content of the soil.

Soil reaction as affected by plowing under hairy vetch, E. B. REYNOLDS, W. R. COWLEY, and J. C. SMITH. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron., 37*

(1945), No. 7, pp. 509-513).—Three years' results are given on the effect of plowing under hairy vetch on the reaction of Lufkin fine sandy loam at College Station, Tex. Plowing under hairy vetch produced a significant increase in the acidity of the soil, at least during the growing season of cotton which followed the vetch. The increase in acidity was more pronounced on the fallowed portion of the plots than on the plots planted to cotton. There were some differences in the pH values of soil samples taken at different dates, but the highest pH values were obtained from the samples taken in July.

Farm manure, L. M. TURK and A. G. WEIDEMANN (*Michigan Sta. Cir.* 196 (1945), pp. 24, illus. 5).—This circular answers, in popular form, 69 questions on the importance of saving and making efficient use of farm manure. The production of manure from farm animals in Michigan is estimated at more than 27 million tons annually, which if saved and used effectively in crop production could produce increased crop yields worth over \$80,000,000, or more than \$400 for each farm in the State. The plant food in this quantity of manure, if purchased in the form of commercial fertilizers, would cost about 10 times as much as Michigan farmers spent for fertilizers in 1942. Topics discussed include quality and composition of farm manure, methods of handling in the barn and in storage, hauling manure directly to the field, use of preservatives, use and application of manure, crops giving best response to manure, fertilizing properties of manure, comparison of composition of fresh and rotted manure, supplementing manure with commercial fertilizers, value of manure as a fertilizer, and the effect of manure on soil tilth.

Factors associated with the utilization of poultry manure, J. F. DAVIS and F. HOFFMANN. (*Del. Expt. Sta.*). (*U. S. Egg and Poultry Mag.*, 51 (1945), No. 1, pp. 28-31).—The authors point out that in 1943 Delaware produced manure containing an estimate 3¼ million dollars worth of nitrogen determined on the basis of the cost of the same amount of nitrogen in commercial fertilizer. The article covers such important items as amount of manure produced, value of poultry manure, methods of handling, and recommendations for use.

Present status of diagnosis of mineral requirements of plants by means of leaf analysis, W. THOMAS. (*Pa. Expt. Sta.*). (*Soil. Sci.*, 59 (1945), No. 5, pp. 353-374).—This is a review of the progress in this field and of the present status of the general method, more than 80 papers on the subject being noted. Topics covered are the influence of certain older procedures; the modern approach; selection of material and sampling technic (choice of tissue, comparative nature of all procedures of diagnosis, sampling procedure, and influence of fruiting); preparation of samples for analysis; observations on method of chemical analysis (the form of combination of the element and analytical procedures); treatment of analytical data (the unit of measurement and the base of reference); and interpretation of results (two main schools of thought, practical application of the principle of minimum ranges, interactions of a metabolic nature, methods of examining interrelationships, and integration of growth to meteorological conditions).

Leaf analysis in estimating the potassium, magnesium, and nitrogen needs of fruit trees, D. BOYNTON and O. C. COMPTON. (*Cornell Univ.*). (*Soil. Sci.*, 59 (1945), No. 5, pp. 339-351, illus. 4).—Leaf analyses for total potassium, magnesium, and nitrogen, expressed on the dry-weight basis, were shown to indicate under some conditions, the needs of fruit trees for these nutrients. The composition of fruit tree leaves with respect to those three elements was also shown to be influenced by the condition of the root system and conducting tissues of the tree, injuries to the leaves from toxic sprays or fertilizers, the age of the leaves, the climate, the season, ionic interrelationships, and the kind and variety of fruit tree. Data indicating the possible significance of these factors are presented.

It is concluded that chemical analysis of leaves for these constituents cannot take the place of careful observations on tree behavior and appearance, on the development of visible leaf or fruit symptoms, and on past climatic and management conditions; nevertheless analyses coupled with these observations may make possible a positive diagnosis that neither alone would have permitted.

Yield-depression effect of fertilizers and its measurement.—III, Agrobiological analysis of certain multiple-factor field tests showing depression by nitrogen. O. W. WILLCOX (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 8, pp. 622-634, illus. 6).—This is a continuation of a series previously noted (E. S. R., 93, p. 14).—The present paper gives an agrobiologic analysis of a nitrogen, phosphorus, and potassium field test with potatoes reported by Carolus (E. S. R., 92, p. 46). When nitrogen was varied while potassium and phosphorus were held constant, the curves of the yields due to nitrogen showed a marked depression effect which became progressively less pronounced where the applications of potassium and phosphorus were progressively increased, but without resulting in a normal yield curve with nitrogen in spite of the use of approximately limited amounts of these two factors. Whatever the cause of the depressive action of nitrogen in this case, it did not act to affect the specific normal nutritive action of potassium and phosphorus, as the yield curves due to these factors conformed to the normal yield equation $y = 120 (1 - 10^{-0.35x})$. This fact is pointed to as a consequence of the Mitscherlich effect law, which postulates that the effect factor of a growth factor is independent of other cultural conditions. A parallel case is cited in a nitrogen and phosphorus field test with sugar beet seed reported by Tolman (E. S. R., 89, p. 540), in which the action of nitrogen was depressive while the yield curves due to phosphorus followed a normal course. Various other details of the graphs of these experiments are discussed as the natural workings of agrobiologic principles that are necessary consequences of the effect law.

Comparative behavior of ammonia and ammonium salts in soils. H. JENNY, A. D. AYERS, and J. S. HOSKING (*Hilgardia [California Sta.]*, 16 (1945), No. 9, pp. 429-457, illus. 19).—The behavior of NH_3 and $(\text{NH}_4)_2\text{SO}_4$ in soils was studied under controlled laboratory conditions. The uptake of nitrogen in soil suspensions containing NH_3 and $(\text{NH}_4)_2\text{SO}_4$ was found to be a function of soil texture. Exceptions were reported, however, being caused by such factors as soil acidity or the nature of the clay mineral.

Acid soils tend to adsorb more nitrogen from NH_4OH than from $(\text{NH}_4)_2\text{SO}_4$. Alkaline soils, as a rule, adsorb more nitrogen from $(\text{NH}_4)_2\text{SO}_4$ than from NH_4OH . Determinations of the depth to which NH_3 compounds penetrate in artificially prepared soil columns for a 10-in. irrigation containing 127 p. m. of nitrogen indicate that in Oakley sand, NH_4OH and $(\text{NH}_4)_2\text{SO}_4$ readily penetrate below a depth of 6 in.; in Yolo sandy loam, penetration was restricted to a depth of 4 in.; in Yolo clay loam, all nitrogen was held in the first 2 in.; and in Aiken clay loam, $(\text{NH}_4)_2\text{SO}_4$ penetrates to greater depth than NH_4OH . The process of nitrogen adsorption is governed by base-exchange reactions. With $(\text{NH}_4)_2\text{SO}_4$ and NH_4Cl the exchange is equivalent. For every NH_4 ion absorbed, a corresponding amount of cation is released. In NH_4OH the amount of NH_3 adsorbed greatly exceeds the number of bases liberated. Ammonia may react with hydroxyl ions of the clay lattice.

Ammonium ions readily displace exchangeable potassium ions from clay particles. The extent of this reaction is greatly influenced, however, by the degree of potassium saturation of the clay. For most soils the release of potassium by NH_3 fertilizers is probably of minor significance. Dry clays readily adsorb NH_3 from vapors containing NH_3 molecules. These molecules are held loosely and may be easily removed by aeration. Judging from experiments with excised plant roots, NH_3 adsorbed on clays can be readily utilized. Likewise nitrification of adsorbed NH_3 is easily

accomplished. The influence of NH_4 on water penetration in artificially prepared soil columns varies so greatly among different soils that no generalizations could be made.

Effects of several nitrogenous fertilizers and soil amendments on the physical and chemical properties of an irrigated soil, D. G. ALDRICH, E. R. PARKER, and H. D. CHAPMAN. (Calif. Citrus Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 4, pp. 299-312).—Marked physical and chemical changes are shown to have occurred in an irrigated soil in plots of a long-term fertilizer experiment after 16 yr. of treatment, the last 4 of which involved the application of much fertilizer. The rate of water percolation through soil treated with sodium nitrate or with ammonium sulfate was markedly less than that through soil treated with calcium nitrate. It was found that if gypsum was applied with the sodium nitrate, and limestone with the ammonium sulfate, percolation was not so poor as without these, but it was still not so good as in the calcium nitrate plot. Urea appeared to have decreased permeability somewhat as compared with that in the calcium nitrate plot, and manure appeared to have decreased it still more than urea, though the manure plots seemed to be in excellent physical condition as indicated by aggregate and macropore-space analyses.

Laboratory measurements of structural breakdown by means of macropore-space analyses produced data from all treatments, with the exception of that of the manure plots, which were well correlated with percolation data. Chemical data obtained on the various plots suggested that the poor physical condition of the sodium nitrate plots is due to an unfavorable calcium-sodium ratio. The poor physical condition of the ammonium sulfate plots appeared to be due to the dispersing action of the ammonium ion, which builds up in the exchange complex as a result of the reduced ability of soil organisms to nitrify the ammonium at the low pH produced by the continued application of ammonium sulfate. The addition of gypsum with the sodium nitrate maintains a calcium-sodium ratio which is conducive to structural stability. The addition of limestone with the ammonium sulfate neutralizes the acidity produced by the application of this fertilizer; soil organisms are then able to nitrify the sorbed ammonium and thus prevent its build-up in the exchange complex in sufficient quantities to cause structural deterioration.

Greenhouse and field tests comparing colloidal phosphate, phosphate rock, and superphosphate as sources of phosphorus for various crop plants, B. E. BROWN and K. D. JACOB. (U. S. D. A.). (*Amer. Fert.*, 101 (1944), No. 13, pp. 7-10, 22-30, illus. 1).—Results of greenhouse and field experiments are presented on the comparative effectiveness of colloidal phosphate, Tennessee brown-rock phosphate, and ordinary superphosphate as sources of phosphorus for various crop plants. On Norfolk loamy fine sand, indicator crops, including German, Hungarian, and Japanese millets, corn, soybeans, and wheat, responded much better to superphosphate treatment. Swiss chard responded equally well to the three sources. When German millet was grown on four widely different soils the yields were greater in every case with the superphosphate treatment. Potato, sweetpotato, and tomato yields in Virginia field experiments were greater when superphosphate was used. While the use of less available raw phosphates may be justified under appropriate soil conditions, especially in the growing of long-season or perennial crops, it is considered to be more likely that an available type of phosphate such as superphosphate, double superphosphate, or ammonium phosphate will provide greater yields and corresponding profits than the slowly available phosphates, particularly in the case of short-season crops.

Absorption by plants of phosphorus from a clay-water system: Methods and ensuing observations, L. A. DEAN and E. J. RUBINS. (U. S. D. A.). (*Soil Sci.*, 59 (1945), No. 6, pp. 437-448, illus. 2).—Standard experimental plants, grown under artificial lighting, were studied to determine their absorption of phosphorus from

clay-water systems Preliminary results with barley seedlings gave no evidence of a contact exchange or other contact effect between plant roots and clay particles which affects the rate of absorption of phosphorus from clay-water systems. Apparently under certain conditions roots of plants lose phosphorus to a surrounding clay-water system.

Retention of phosphates by soils.—II, Effect of drying and of certain cations and anions on the cation-exchange capacity of soils, F. L. DAVIS. (La. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 2, pp. 175–190, illus 2).—In this second paper (E. S. R., 90, p. 735) studies are reported on the cation exchange properties of a number of soil samples that had been brought to equilibrium in soil- H_2O - $\text{Ca}(\text{OH})_2$ - CO_2 -air systems. Data concerning the effect of additions of monocalcium phosphate and of ferric and aluminum chlorides upon the cation-exchange capacity and reaction of the soil in this system are given.

In part, these observations are held to indicate that thorough air-drying of soil samples reduced the exchangeable hydrogen and cation exchange capacity of acid soils having a low degree of base saturation. Liming soils with $\text{Ca}(\text{OH})_2$ or $\text{Ca}(\text{HCO}_3)_2$ under laboratory conditions produced an increase of the measurable cation-exchange capacity, an increase separate from, and independent of, the increased adsorption of polyvalent cations by soils which results from the formation of basic salts with the weak colloidal acids. Phosphates react with the basic constituents of soils, apparently in an anionic replacement of the hydroxyl ions with phosphate ions. The change in cation-exchange capacity produced by liming was relatively large and increased in direct relationship to the hydroxyl-ion concentration. The increase in cation-exchange capacity resulting from the addition of monocalcium phosphate was relatively small and was dependent upon the quantity of phosphate added. The reaction of phosphates with the soil complex results in strongly associated ions which increase the base-exchange complex and modify the pH value of the soil. Whether the orthophosphate is combined by the soil as the monocalcium or dicalcium form, or is precipitated as tricalcium phosphate, depends upon the pH at which the reaction occurs.

The addition of $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ and $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$ to the H_2O - $\text{Ca}(\text{OH})_2$ -soil systems decreased the cation-exchange capacity and increased the soil acidity of all samples. The concurrent changes in exchange capacity and pH value of the soil produced by additions of monocalcium phosphate and iron and aluminum chloride resulted in little or no change at reactions below pH 7.2, in the relationship between base-exchange capacity and soil reaction of the several series. When the Fe and Al added were equivalent to the added phosphate, their effect upon cation exchange capacity approximately offset the effect of the phosphate in those samples having a soil reaction below pH 7.3.

The divergent behavior of KPO_3 and K_2SO_4 in soils, with and without limestone and dolomite, W. H. MACINTIRE, W. M. SHAW, and B. ROBINSON. (Tenn. Expt. Sta.). (*Soil Sci.*, 59 (1945), No. 2, pp. 155–162).—During the first year, the retention of K from every light incorporation of KPO_3 exceeded that from the corresponding incorporation of K_2SO_4 ; at the heavy rate, the reverse was true for unlimed and limed soils. Limestone and dolomite repressed the outgo of K from native stores and from every potassic addition save the heavy incorporation of KPO_3 in the silt loam of higher exchangeable K-Ca-Mg content. K-metaphosphate diminished the outgo of Ca and Mg from their native stores in both soils and from the quantities supplied by limestone and dolomite. Magnesium outgo was repressed by every limestone incorporation, alone and with either K_2SO_4 or KPO_3 . In the lessened outgo of both Ca and Mg from dolomite in its joint addition with KPO_3 , the two bases were leached in more equal proportion than in the absence of the metaphosphate. The conservation of Ca and Mg induced by K-metaphosphate, in

contrast to the exchange and consequential depletion induced by K_2SO_4 , is attributed to phosphate precipitations of the two bases that otherwise would have been retained in the leaching, and to protective action of the K of KPO_3 upon the Ca and Mg in the soil complex. The concomitant fixation of the K from the light addition of the readily soluble KPO_3 occurred as though the K were added in alkaline form. Because of the greater precipitation of Ca and Mg induced by KPO_3 at the heavy rate, accompanied by increased sulfate outgo and lessened retention of the incorporated K, the resultant recovery of K can be attributed to outgo of K_2SO_4 . Incorporated alone, K-metaphosphate apparently stimulated sulfofication, as indicated by marked increase in sulfate outgo from both soils; incorporated with limestone, and with dolomite, it did not augment the corresponding accelerative effect of the two liming materials. Leachability of sulfates derived from K_2SO_4 was increased by the disintegrated incorporations of limestone.

Nitrogen, phosphoric acid, and potash consumption in the United States, by years and by States, with preliminary figures for 1944, A. L. MEHRING, H. M. WALLACE, and M. DRAIN. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 8, pp. 595-609, illus. 1)—This article presents data on the consumption of the three major plant nutrients, by States, for a series of years to bring out trends in usage and the effects of war on consumption. The United States in 1944 consumed 12,468,000 tons of fertilizers which contained 626,000 tons of nitrogen, 1,305,000 tons of phosphoric acid, and 642,000 tons of potash. Commercial organizations sold directly to farmers and gardeners 591,000 tons of nitrogen, 1,121,000 tons of phosphoric acid, and 620,000 tons of potash in the continental part of the country and 32,000 tons of nitrogen, 17,000 tons of phosphoric acid, and 22,000 tons of potash in the noncontiguous territories. Government agencies disposed of 3,164 tons of nitrogen, 167,569 tons of phosphoric acid, and 17 tons of potash. Nitrogen consumption in 1944 was 120,000 tons greater than in 1943, that of P_2O_5 was 60,000 tons greater, and that of K_2O was about the same. Compared with 1934, however, potash consumption increased more than that of either of the others. Total plant food consumption from 1943 to 1944 increased most on a percentage basis in the Western and West North Central States. The average increase in these States was 30 percent. The total tonnages of plant food used in the New England and South Atlantic States remained almost the same in 1944 as in 1943, although a few States used slightly less.

Commercial fertilizers in Kentucky in 1944, J. D. TURNER, H. R. ALLEN, and L. GAULT (*Kentucky Sta. Regulat. Ser. Bul.* 42 (1945), pp. 51).—The annual fertilizer analysis report for 1944 is accompanied by information for manufacturer, dealer, and consumer concerning the State fertilizer law.

Mineraldünger und Landmaschinen als Hauptstützen der grossdeutschen Landwirtschaft [The influence of mineral fertilizers and farm machinery on the principal agricultural areas of Germany], O. ENGELS and H. SCHMITT (*Berlin SW 68: Allgemeiner Industrie-Verlag Knorre & Co. K.-G.*, 1943, pp. 299, about 85 illus.).—A well-illustrated historical account of the development of agriculture in Germany, with special reference to progress made in recent years on the use of commercial fertilizers and agricultural machinery, and presenting many revealing facts on agricultural conditions.

AGRICULTURAL BOTANY

Lehrbuch der Botanik für Hochschulen [Textbook of botany for colleges], E. STRASBURGER ET AL. (*Jena: Gustav Fischer*, 1944, 22 ed., rev., pp. 620+, illus. 831).—The twenty-second edition of this well-known textbook (E. S. R., 26, p. 227).

Automatic electric switch for constant air pressure, R. O. FREELAND (*Science*, 102 (1945), No. 2644, pp. 231-232, illus. 1).—In measuring such physiological processes as respiration, photosynthesis, and transpiration by methods involving the continuous flow of air around the plant material it is often desirable to have the rate of air movement remain uniform. A constant air pressure gradient facilitates this end. To accomplish this purpose the author has devised a pressure switch for automatically controlling an electrically driven air pump; this in turn maintains a fairly constant partial vacuum in an air reservoir. The general plan of the apparatus is described, and a detailed drawing of the pressure switch is presented.

A simple and effective humidity control, R. H. WALLACE and R. J. BUSHNELLI (Univ. Conn.). (*Plant Physiol.*, 20 (1945), No. 3, pp. 443-447, illus. 2).—The device designed and here described consists essentially of a radio tube whose grid is activated by the opening and closing of the contacts of a humidistat; this tube runs a motor which turns an eccentric. The eccentric compresses and releases the rubber bulb of a Bunsen water pump which delivers water from a reservoir into a glass tube leading into the top of an evaporator. The fan in the latter runs continuously, but water to maintain humidity is added only when the humidistat calls for it. The mechanism is said to function very consistently, and any humidity can be maintained within 1 percent. The equipment is fully described and illustrated.

[Botanical reviews] (In *Annual Review of Biochemistry*, XIV, edited by J. M. LUCK and J. H. C. SMITH. (Stanford University, Calif: Ann. Rev., Inc., 1945, vol. 14, pp. 665-772).—The following reviews are of special interest to agricultural botany: Nitrogenous Constituents of Plants, with 69 references, by J. G. Wood (pp. 665-684); Biological Nitrogen Fixation, with 116 references, by R. H. Burris and P. W. Wilson (pp. 685-708) (Univ. Wis.); Mineral Nutrition of Plants, with 81 references, by H. D. Chapman (pp. 709-732) (Calif. Citrus Expt. Sta.); The Chemistry and Metabolism of Bacteria, with 99 references, by J. H. Mueller (pp. 733-748); and The Chemistry of Antibiotic Substances Other Than Penicillin, with 127 references, by A. E. Oxford (pp. 749-772).

Textbook of bacteriology, E. O. JORDAN and W. BURROWS (*Philadelphia and London: W. B. Saunders Co. 1945*, 14. ed., rev., pp. 909+, illus. 242).—This edition "is more than a revision in the usual sense, for in it the process of rewriting, begun in the preceding edition [E. S. R., 87, p. 418], has been continued. The chapters on the yeasts, the molds, and the actinomycetes, previously only brought up to date, have been replaced by a completely new and relatively long chapter on medical mycology. Similarly, the chapter devoted to the parasitic protozoa has been replaced by a longer chapter on medical parasitology which includes the flukes, tapeworms, and roundworms in addition to the protozoa. With minor exceptions the illustrations are completely new and, in the great majority of cases, original In the process of revision a good deal of new material has been added."

The effects of cations upon bacterial viability, H. BINSTOCK (*Univ. Pittsburgh Bul.*, 41 (1945), No. 4, pp. 32-37).—A certain concentration—usually very low—was found for nearly all the involved cations stimulatory to growth; there was also a limit beyond which the stimulating action passed over into a bacteriostatic and ultimately into a bactericidal effect. On the whole, the higher the concentration the more evident did the toxic action become. Bivalent cations were generally more toxic than trivalent cations, which, in turn, were more toxic than monovalent cations except for monovalent silver, which proved the most toxic of any tested. On the whole, the heavier metals were more toxic than the lighter ones, but there was no strict quantitative relation. All cations used except Ni, Cu and Zn produced some stimulation of growth of *Bacillus prodigiosus* to an extent above the controls, with a bactericidal effect in all cases at the high concentrations. The order of increasing toxicity for *B. prodigiosus* was K, Na, Cr, Fe, Zn, Co, Al, Ni, Cu, Ce, Pb, and Ag.

All cations produced some stimulation on *Staphylococcus citreus* at low concentrations, as well as a bactericidal effect at high concentrations; the increasing order of toxicity for this organism was K, Na, Cr, Al, Fe, Ni, Cu, Co, Ce, Zn, Pb, and Ag. Different organisms varied in their susceptibility to the disinfectant action of the same cation. The concentrations toxic to *S. citreus*—as a whole—were lower than those toxic to *B. prodigiosus*, but the concentrations stimulating growth of *S. citreus* were generally higher than those acting similarly on *B. prodigiosus*. In their indirect effect on bacterial viability the cations exerted the same qualitative action but differed in their quantitative effects. •

An application of the lyophile process to the maintenance of cultures for microbiological assay, M. C. NYMON, I. C. GUNSALUS, and W. A. GORTNER. (Cornell Univ.). (*Science*, 102 (1945), No. 2640, pp. 125-126, illus. 1).—In the experiments reported, cultures of *Lactobacillus arabinosus* and *L. casei* maintained their activity when lyophilized by the simple procedure described; after 3 mo. in storage they gave as good a response as the usual standard cultures maintained by weekly transfer through broth to tryptone agar. The lyophile process as used requires no special equipment and could be accomplished in any laboratory at very little cost. It is felt that this procedure as applied to microbiological assay organisms is saving of time, labor, and culture materials; it also improves the reproducibility of the assay curves insofar as they are influenced by the bacterial cultures.

Studies on vitamin "Bc" produced by microorganisms, P. R. BURKHOLDER, I. McVEIGH, and K. WILSON (*Arch. Biochem.*, 7 (1945), No. 2, pp. 287-303, illus. 2).—Determinations of the total vitamin Bc activity via the *Lactobacillus casei* assay method were made on autolyzed and enzyme-digested cultures of 82 bacterial strains, 369 yeasts, and 84 molds. A crude enzyme mixture prepared from pancreas proved most satisfactory among the methods tried for releasing conjugated Bc in microorganisms. No evidence was found for increase of Bc activity in reaction mixtures of rat liver or chicken pancreas to which xanthopterin had been added, and supplying this pterin to cultures of bacteria or yeasts failed to stimulate production of this vitamin. Certain bacterial strains found to produce considerable amounts of Bc also showed considerable Bc conjugase activity. It is suggested that selected micro-organisms may prove useful for large scale production of Bc concentrates.

Studies in aerobic cellulose decomposition.—I, The course of cellulose decomposition by *Cytophaga*, G. FÄHRÆUS (*Lantbr. Högsk. Ann. [Uppsala]*, 12 (1944-45), pp. 1-22, illus. 3).—A survey is presented of earlier investigations (45 references) of *Cytophaga* and other cellulose-decomposing organisms; as to *Cytophaga*, the general opinion has been that it does not hydrolyze cellulose, but rather oxidizes it to oxycellulose. A method is presented for culturing *Cytophaga* on plates with cellulose and of producing dry preparations of these bacteria for enzymic studies; the substrates used were cellulose hydrate and lichenin in a phosphate buffer at pH 7.4. In experiments with two strains of *Cytophaga* by this method it is shown that cellulose was broken down to a reducing substance proving to be glucose. Cultures grown on cellulose and on glucose yielded a mucilage of the same character in both cases; this was found to contain uronic acid. The conclusion is drawn that *Cytophaga* splits cellulose hydrolytically, and in the course of this process glucose arises. The glucose formed is then immediately used up by the bacteria. The mucilage is believed to be a product synthesized from low molecular substances.

Studies on certain butyric acid producing organisms isolated from hemp and similar vegetable fibres, C. WEIZMANN and E. HELLINGER (*Palestine Jour. Bot.*, 4 (1944), No. 2, R Ser., pp. 51-76, illus. 9).—An account is given of the isolation of a number of butyric acid bacteria from hemp, jute, and flax from Palestine, India, and Manila; detailed taxonomic, morphological, and cultural studies of 10

of them (*Clostridium* strains) are presented. A review is also given of the literature (39 references) dealing with similar organisms obtained from plant fibers.

A proposed biochemical basis for the genus *Pseudomonas*, W. C. TOBIE (*Jour. Bact.*, 49 (1945), No. 5, pp. 459-462).—It is suggested that the genus should comprise rod-shaped bacteria producing water-soluble phenazine pigments—regardless of color of the pigments—or water-soluble fluorescent pigments, or both. Since these pigments apparently have a significant role in the bacteria secreting them, the proposed classification—it is believed—would be much more rational from both biochemical and physiological standpoints. It is felt that bacteria producing pigments of a demonstrably different chemical nature should be excluded from the genus.

Amino acid requirements of *Acetobacter suboxydans*, J. L. STOKES and A. LARSEN (*Jour. Bact.*, 49 (1945), No. 5, pp. 495-501, illus. 1).—*A. suboxydans* is of considerable interest because of its remarkable inability to dissimilate organic carbon compounds beyond the initial stages of oxidation; this property and its ability to transform large amounts of substrate have suggested its use for large-scale production of various organic compounds. The oxidation of sorbitol to sorbose—used in the synthesis of ascorbic acid—is a well-established commercial process. In this study the organism multiplied to a limited extent in a medium consisting of glycerol, salts, essential growth factors, and a combination of valine, isoleucine, alanine, and histidine as the N sources, but growth was considerably improved by adding either cystine or methionine. The further addition of proline increased growth to the level obtainable with hydrolyzed casein or a mixture of 20 amino acids; development, however, was not so rapid and was somewhat less extensive than with yeast extract. At suboptimum concentrations of the six required amino acids, $(\text{NH}_4)_2\text{SO}_4$ stimulated growth. Resting-cell suspensions deaminated most amino acids under aerobiosis. Both optical isomers of alanine, serine, and aspartic acid were attacked. Under aerobiosis only serine was appreciably deaminated.

A study of some environmental factors which control endospore formation by a strain of *Bacillus mycoides*, G. KNAYSIS (Cornell Univ.). (*Jour. Bact.*, 49 (1945), No. 5, pp. 473-493).—By a new technic described, it is shown that accumulation of byproducts of metabolism in strain C₂ of *B. mycoides*—such as acid products of glycolysis—tends to inhibit sporulation. Oxygen may be necessary for some process in the forming of endospores, but its principal effect is in greatly increasing the metabolic rate and the degree to which nutrients are utilized. As a result there is a minimum accumulation of byproducts; e. g., glucose is oxidized to CO_2 and probably water, and acids do not accumulate in the medium. Although endospores may be formed within a long interval of pH, there is a definite optimum at 6.6-6.8; the significance of this optimum is not clear, but may well be related to the utilization of nutrients and the accumulation of byproducts. Thiamine promotes sporulation—though apparently not affecting growth—on agar slants of a simple medium in which there is a tendency for acid byproducts to accumulate; it has no effect on either growth or sporulation in agar slants of vitamin-free casein hydrolyzate in which no acid byproducts accumulate. The effect of the vitamin in the synthetic medium is indirect and due to an increase in the rate of decarboxylation of the acid byproducts. It is assumed that the vitamin is readily synthesized in the casein hydrolyzate medium. Gradual drying does not usually affect sporulation unless it influences growth and the availability of nutrients. With rare exceptions, when drying exerts an effect it is detrimental. Suspending vegetative cells in distilled water promotes sporulation of the uninjured cells; MgSO_4 increases the vegetative sporulation and has a beneficial effect on sporulation when the O_2 supply is low or limited. Endospores do not germinate in distilled water or an

incomplete nutrient such as a synthetic medium without a source of available energy, but they germinate readily in the presence of the necessary nutrients, even when the environment is unsuited to further growth. It is concluded that in this strain endospores are formed most readily by healthy cells faced with starvation in the presence of O_2 . There are 20 references.

Strain specificity and production of antibiotic substances, V, VI. (N. J. Engl. Stas.) (*Natl. Acad. Sci. Proc.*, 31 (1945), Nos. 6, pp. 157-164, 7, pp. 208-214).

V. *Strain resistance of bacteria to antibiotic substances, especially to streptomycin*, S. A. Waksman, H. C. Reilly, and A. Schatz.—In continuation (E. S. R., 93, p. 549), different strains of the same bacterial species were found to vary greatly in their responses to streptomycin. The ratio of sensitivity to a given preparation varied for *Escherichia coli* from 100 to 10 units (average 35); for *Proteus vulgaris*, 75 to 10 units (average 35); for *Staphylococcus aureus*, 20 to 75 units (average 34); and for *Bacillus subtilis*, 30 to 250 units (average 109). A streptomycin-resistant strain of *P. vulgaris* also exhibited a certain degree of resistance to streptothricin but none at all to clavacin. A strain of *S. aureus* that was made only slightly resistant to streptomycin showed no resistance to streptothricin. Several highly resistant strains of *S. aureus* gave no evidence of increase in resistance to clavacin or to an antibiotic substance isolated from a spore-forming soil bacterium, and only a trace to streptothricin. There are 15 references.

VI. *Strain variation and production of streptothricin by Actinomyces lavendulae*, S. A. Waksman and A. Schatz.—Different cultures of *A. lavendulae* varied greatly in capacity to produce streptothricin. Active cultures were found to give variants differing morphologically, culturally, and physiologically from the parent strain. Variants free of aerial mycelium failed to produce streptothricin. There are 19 references.

Mycology presents penicillin, C. THOM (*Mycologia*, 37 (1945), No. 4, pp. 460-475).—Following a historical presentation—the first 10 yr., the Fleming organism comes to America, and penicillin comes to America—the author presents data on current knowledge of *Penicillium notatum*—its aerobic nature, ventilation of cultures, its behavior in pure culture, variability, selected strains, the culture medium, temperature relations, penicillin production as marking a physiological stage of the colony, and submerged cultures.

Quantitative action of penicillin inhibitor from penicillin-resistant strains of staphylococci, W. W. SPINK and V. FERRIS (*Science*, 102 (1945), No. 2644, pp. 221-223, illus. 2).—Data are presented as showing that one of the mechanisms by which staphylococci develop resistance to penicillin is the production by the organisms of a potent inhibitor. That this is not the only mechanism involved is indicated by the fact that staphylococci which have become resistant in vitro do not yield a demonstrable inhibitor. It is believed that changes in bacterial metabolism are involved in both instances. An elapse of time proved essential for the inhibitor from staphylococci to overcome the antibacterial action of penicillin. With increasing amounts of inhibitor, the antistaphylococcal effect of penicillin was more promptly overcome, whereas decreasing quantities of inhibitor required increasing periods of time to inhibit the penicillin.

Kojic acid and the antibiotic action of species of Aspergillus, A. H. COOK and M. S. LACEY (*Nature [London]*, 155 (1945), No. 3948, pp. 790-791).—The authors deem it evident from their cultural and chemical studies of *A. parasiticus*—along with tests against a range of gram-positive and gram-negative bacteria—that even though kojic acid is produced, only a part of the antibacterial activity can be ascribed to this compound. Clearly at least two antibiotics were produced in these experiments, the speed of their production apparently depending on the availability of the carbohydrate nutrient; it is also believed possible that more than two antibiotics were synthesized.

Antagonistic action of a red mould pigment against bacteria of the typhoid-paratyphoid-dysentery group, L. ROSENTHAL (*Science*, 102 (1945), No. 2642, pp. 176-177).—A mold bearing no resemblance to any of the known pathogenic fungi but producing a characteristically dark red pigment diffusing readily into the medium was isolated from human hair planted on Sabouraud's agar. When typhoid, as well as paratyphoid or dysentery (Shiga and Flexner strains) bacilli—not susceptible to the action of penicillin—were seeded on agar plates a clear zone of inhibition always appeared in the cup filled with pigment solution and placed on the agar surface. Cultures of the mold grown on media which did not produce the pigment failed to show antibiotic action. The pigment proved stable and did not lose its antibiotic property after autoclaving, acidification, or alkalization.

Ação bacteriostática de um cogumelo macroscópico pertencente à família das poriporaceas "*Polyporus cinnabarinus* (Jacq.) Fries." [Bacteriostatic action of *P. cinnabarinus*], J. R. MEYER (*Arq. Inst. Biol. [São Paulo]*, 15 (1944), pp. 27-36; *Eng. abs.*, p. 35).—Experimental assays carried out under standard conditions indicated this wood-rotting fungus to possess marked bacteriostatic action on several strains of *Staphylococcus*, *Streptococcus*, and *Pasteurella avicida*.

Flagellar studies on zoospores of some members of the Mycetozoa, Plasmodiophorales, and Chytridiales, B. R. ELLISON (*Mycologia*, 37 (1945), No. 4, pp. 444-459, illus. 4).—A condensation of a dissertation for the master's degree. It was confirmed by this study that the swarm cells of the Mycetozoa have two blepharoplasts and established that the flagellum of *Stemonitis ferruginea*, *S. fusca*, and *Fuligo septica*—and by inference the entire Mycetozoa—is of the whiplash type or a modification thereof. A germinating spore of *Plasmodiophora brassicae* was seen to have two actively beating flagella of the mycetozoan type. This type of flagellum was also shown to occur in *Synchytrium decipiens* and *Nowakowskiella* sp. The indication is believed very strong that the knobbed flagellum is a modification of the whiplash type and not always degenerative in nature.

Morphogenesis of fungus colonies in submerged shaken cultures, P. R. BURKHOLDER and E. W. SINNOTT (*Amer. Jour. Bot.*, 32 (1945), No. 7, pp. 424-431, illus. 2).—Observations on this type of culture were made on about 150 species of fungi grown in three kinds of nutrient solution. In still cultures most fungi formed mats of floating mycelium at the surface; in agitated cultures, they developed discrete globose colonies commonly possessing characteristic metabolism, color, texture, and surface features. The tissues of these colonies were usually prosenchyma, elastic, and spongelike, with fluid filling the interhyphal spaces. Typical colonies may develop from germinating single spores or groups of spores, from mycelian fragments, or from whole perithecia, etc. Polarized growth of the sporelings gives way in early developmental stages to branched hyphae which continue to grow outward and intertwine so as to form a globose body. The developmental history of *Penicillium notatum* was studied at various stages of growth from spore germination to the formation of large colonies. The growth rate, texture, and characteristic surface features of fungus colonies varied considerably with differences in the composition of the medium. Alternating temperature and intermittent shaking resulted in the development of alternating zones differing in texture. Delayed shaking resulted in the formation of colonies with irregular shape. It is suggested that the development of spherical colonies results from their equal exposure on all sides to various factors such as gravity and chemical gradients, which in still cultures would be unilateral in incidence and effect. The genetic constitution of an organism, as illustrated by these plants, evidently reacts to three types of environmental influences, viz, (1) external factors to which it is exposed on one side more strongly than on the other and which thus tend to produce oriented or unsymmetrical growth, (2) external factors to which it is exposed equally on

all sides but which by differences in character or quality produce diverse effects, and (3) factors in the internal environment more immediately under genic control and relatively independent of external influences

Preservation of molds by the lyophil process, K. B. RAPER and D. P. ALEXANDER. (U. S. D. A.). (*Mycologia*, 37 (1945), No. 4, pp. 499-525, illus. 3).—The authors report that all members studied of the genera *Aspergillus* and *Penicillium* can be preserved in lyophil or desiccated form. Such evacuated preparations—tested at intervals up to 40 mo.—usually exhibited no reduction in viability, and resulting cultures were entirely typical of the strains under observation. Representative species of the Mucorales were successfully preserved, and for *Rhizopus*, *Phycomyces*, and other genera there was evidence of a marked extension of viability. Attempts to preserve members of the Entomophthorales were unsuccessful. Representatives of the Hyphomycetes were viable when tested at about 20 mo. Molds preserved in lyophil form appeared to retain their biochemical and physiological characteristics unaltered. Strains of *A. terreus* thus preserved produced undiminished yields of itaconic acid after 40 mo., and strains of *Penicillium notatum* and *P. chrysogenum* retained at original levels their capacity to produce penicillin. The lyophil technic provides a convenient means of preserving a large number of replicate cultures for use as “seed” material for standard cultures or for setting up a series of fermentations over an extended period. Storage becomes a minor problem because of the small dimensions of the preparations, and the possibility of contamination is eliminated. There are 15 references.

The sugar tolerance of four strains of distillers' yeast, W. D. GRAY (*Jour. Bact.*, 49 (1945), No. 5, pp. 445-452, illus. 2).—The ability to utilize glucose exhibited by the four strains of *Saccharomyces cerevisiae* studied was found to be affected by its initial concentration in the medium to be fermented; these yeasts also varied in their capacity to tolerate high concentrations of sugar. The results of treating them with glucose solutions of different concentration indicated that the inhibition at high glucose concentrations was due, at least in part, to osmotic phenomena. It is suggested that a rough determination of the sugar tolerance of a yeast can be made easily by use of the microscope and glucose solutions at various strengths; for accurate determinations, however, the fermentation method is recommended.

The synthesis of para-aminobenzoic acid by yeast, J. O. LAMPEN, H. L. BALDWIN, and W. H. PETERSON. (Wis. Expt. Sta.). (*Arch. Biochem.*, 7 (1945), No. 2, pp. 277-286).—The *p*-aminobenzoic acid (PAB) contents of various yeast samples were determined via *Clostridium acetobutylicum* and *Acetobacter suboxydans*, assays by the two agreeing well. Most of the PAB in yeast was found to occur free—in a soluble form available to the above bacteria. Destruction occurred during acid hydrolysis. Autolysis failed to release any PAB. Autoclaving with 5 N NaOH gave slightly increased values over water extraction. PAB was synthesized in large amounts during the growth of yeast, twenty- to eightyfold increases occurring both under commercial conditions and on synthetic media. One to 6 mg. of PAB were produced per liter; 80 percent or more of this was found in the medium, with only a small percentage remaining in the yeast cells. There are 18 references.

Notes on Wisconsin parasitic fungi, VII, H. C. GREENE. (Univ. Wis.). (*Amer. Midland Nat.*, 34 (1945), No. 1, pp. 258-270).—Unless otherwise specified, these miscellaneous notes are based on collections in Dane County in the vicinity of Madison during 1944 (E. S. R., 92, p. 516).

A list of fleshy fungi of Fishers Island, N. Y., C. C. HANMER (*Torreyia*, 45 (1945), No. 2, pp. 38-40).

The structure and reproduction of the algae.—I, Introduction, Chlorophyceae, Xanthophyceae, Chrysophyceae, Bacillariophyceae, Cryptophyceae, Dinophyceae, Chloromonadineae, Euglenineae, colourless flagellata; II, Foreword, Phaeophyceae, Rhodophyceae, Myxophyceae, F. E. FRISCH (*Cambridge, Eng.: Univ. Press, 1935, vol. 1, pp. 791+*, *illus. 246; 1945, vol. 2, pp. 939+*, *illus. 339*).

A contribution to our knowledge of the wild and cultivated flora of Massachusetts, I, H. N. MOLDENKE (*Torrey*, 45 (1945), No. 2, pp. 41-52).—An annotated list of 223 collections, representing 192 species and subspecies in 155 genera and 72 families—one in a series on the floras of the different States of the United States.

The Leguminosae in Iowa, W. B. FOX (*Amer. Midland Nat.*, 34 (1945), No. 1, pp. 207-230).—This taxonomic study deals with the leguminous plants—native and established—known by the author to occur in the State. It constitutes an attempt to present a useful and simplified treatment of the species of this large and diversified family occurring in Iowa and to show their distribution within the State insofar as is indicated by the collections studied. A key to the genera considered and keys to the species of all genera containing more than two species are provided. Brief supporting descriptions are given for most of the species and for a few genera where additions to the characters given in the key are deemed advisable.

Measures of the amount of ecologic association between species, L. R. DICE (*Ecology*, 26 (1945), No. 3, pp. 297-302).—"The coefficient of association of [S. A.] Forbes indicates the amount of association between two given species compared to the amount of association between them expected by chance. In order to provide a simple direct measure of the amount of association of one species with another the association index is proposed. If a is the number of random samples of a given series in which species A occurs and h is the number of samples in which another species B occurs together with A, then the association index $B/A = h/a$. Similarly, if b is the number of samples in which species B occurs, then the association index $A/B = h/b$. There is also proposed a coincidence index, $2h/(a + b)$, whose value is intermediate between the two reciprocal association indices. As a measure of the statistical reliability of the deviation shown by the samples of a given series from the amount of association expected by chance, the chi-square test may be used."

A factor in clover nodule formation associated with the volume of the medium occupied by the roots, P. S. NUTMAN (*Nature [London]*, 156 (1945), No. 3949, p. 20).—During the course of experiments in which clover seedlings were grown on agar medium in test tubes, it was noted that the number of nodules per plant depended on the number of plants in a tube; as the nodule bacteria were present in very large numbers, this variation could not have been due to any paucity of organisms. In the absence of detectable competition effects in the studies briefly reported, it appeared probable that the phenomenon could be attributed to some nodule- and lateral root-inhibiting excretion from the roots, the concentration of which varied with plant number and volume of root medium; this hypothesis is being tested.

Symbiotic nitrogen fixation, A. I. VIRTANEN (*Nature [London]*, 155 (1945), No. 3947, pp. 747-748).—A brief summary of the results of the author's wartime investigations of strains of *Rhizobium*.

Effect of mechanical stimulation on the electrical and curvature responses in the *Avena* coleoptile, A. R. SCHRANK (*Plant Physiol.*, 20 (1945), No. 3, pp. 344-358, *illus. 3*).—The oats coleoptile responds to mechanical stimuli applied to one side of the apical 10 mm. by establishing a transverse electrical polarity oriented so that the stimulated side becomes electronegative in the external circuit to the unstimulated side, and by bending toward the electronegative and stimulated side. The magnitude of this polarity, its rate of change, and the rate of growth curvature

depend on the duration of the stimulus. Mechanical stimulation of the apical 5 mm. has essentially the same effect as that of the apical 10 mm. Changing the coleoptiles from vertical to horizontal causes them to establish a transverse electrical polarity with the lower side electropositive to the upper and then to bend upward. Simultaneous mechanical stimulation of the apical 10 mm. of the upper side establishes a transverse electrical polarity of greater magnitude than gravity alone and also increases the rate of upward curvature. Similar mechanical stimulation of the lower side establishes a reversed (opposite to gravitational) electrical polarity, inhibits upward curvature for 25 min., and decreases the subsequent rate of bending. Oats coleoptiles with the apical 3 mm. removed 2 hr. 10 min. before a combination of mechanical and gravitational stimuli are applied establish a transverse electrical polarity 5 mm. below the apex of about the same magnitude as undecapitated plants similarly stimulated. The fact that decapitated plants manifest no upward curvature indicates that the presence of growth substances is unessential to establishment of a transverse electrical polarity. All data from these findings are believed compatible with the Went-Kögl "electrophoretic" growth hormone transport theory; they do not, however, demonstrate a causal relationship between electrical polarity and auxin transport. There are 24 references.

A rapid extraction method for free auxin and its application in geotropic reactions of bean seedlings and sugar-cane nodes, J. VAN OVERBEEK, G. DÁVILA OLIVO, and E. M. SANTIAGO DE VÁZQUEZ (*Bot. Gaz.*, 106 (1945), No. 4, pp. 440-451, illus. 3).—When sugarcane nodal tissue was submerged for a few minutes in boiling water, a substance was released which suppressed the action of indoleacetic acid in the *Avena* test. This substance proved soluble in water and diethyl ether but not in petroleum ether. It is therefore extracted with auxin; for this reason heating of such plant material—and perhaps of plant material in general—prior to ether extraction is an undesirable step in the auxin extraction technic. In the course of ether extraction there is during the first half hour a gush of auxin; soon, however, the rate slows down to a mere trickle, which continues for many months. When the auxin of the upper and lower halves of horizontal hypocotyls of bean seedlings is extracted—using only the auxin yielded rapidly during the early part of the extraction—33 percent is obtained from the upper and the rest from the lower side; this happens to be the precise average auxin distribution found for free auxin as determined by the diffusion method. When the auxin of the upper and lower halves of horizontal hypocotyls of bean seedlings is extracted, using only the auxin yielded slowly during the later part of the process, no such unequal yields are obtained. It thus appears that the auxin yielded during the early part of the extraction is the free auxin of the plant tissues.

A rapid technic for extracting free auxin consists in freezing the plant tissue in dry ice, extracting in Erlenmeyer flasks in ether for two to three periods of a half hour each at room temperature, taking the extract up in a known quantity of agar, and using it on the *Avena* test. When the free auxin content of horizontal stems of sugarcane was compared with stems in the vertical position the auxin concentration in the meristem region of the node (growth ring) increased 100 percent and more; this was less marked in the root band and was absent in the midportion of the internodes. The unilateral distribution of free auxin, so striking in horizontal bean seedlings, was absent in sugarcane. In further contrast to bean seedlings, no growth response to applied auxin—other than promotion of root growth and bud inhibition—was found in sugarcane. With respect to stability to hot alkali and lability to hot acid, the auxin extracted from etiolated bean hypocotyls and from sugarcane appeared to be of the indoleacetic acid type rather than auxin-a or auxin-b. Both the auxin yielded during the early part of the extraction and that during the prolonged later part of the process belonged to the indoleacetic acid type. There are 21 references.

Effect of indoleacetic acid in inhibiting stem abscission in *Mirabilis jalapa*, J. M. BEAL and A. G. WHITING (*Bot. Gaz.*, 106 (1945), No. 4, pp. 420-431, illus. 7).—In intact untreated plants of *M. jalapa* the main axis grew vigorously with neither abscission nor formation of an abscission zone in the internodes during the experimental period. If the plants were decapitated in the upper part of the first internode when the second internode had just started to elongate and given no additional treatment, growth in the internodes ceased, followed by abscission after 2 weeks or longer. Preceding abscission, two transverse meristems developed; the upper one formed across the base of the internode and developed into a zone in which abscission occurred, while the lower one—invariably present when the upper one developed—seemed to play no active role in the abscission process. Relatively little storage starch remained in the cotyledonary nodal region of these plants at 2 weeks after decapitation. Plants similarly decapitated and treated with 2 percent indoleacetic acid-lanolin on the cut surfaces showed continued growth of the internodes, complete disappearance of stored starch, and the entire absence of abscission or of an abscission zone at the internode bases.

Plant-injection methods for the diagnosis of mineral deficiencies in tobacco and soya bean, B. N. LAI (*Ann. Bot. [London], n. ser.*, 9 (1945), No. 35, pp. 283-295, illus. 17).—In tobacco, the leaf-stalk injection technic proved most useful for diagnosing mineral deficiencies. Injected dye solution in the second and third leaves above the point of application permeated only the side of the leaf nearer that point; leaf 4 was not permeated by the dye but half of it was permeated by some of the nutrients. Injection of solutions containing compounds of N, P, K, Mg, and Fe into tobacco leaf stalks led, in 9 or 10 days, to an improvement in the color of the proximal sides of leaves 2 and 3 and also in one side of leaf 4. Growth increases were detected—both by a puckering of the surface and by actual measurement in the permeated v. the unaffected halves of these leaves—following injections of K, Mg, and Fe. Deficiencies in N, P, K, Fe, and B were diagnosed in soybean by plant injection methods. Here the interveinal technic proved best; Fe deficiency was diagnosed in 2 days. Injection by the leaf-stalk method resulted in permeation of nearly the entire soybean plant.

The use of the C^{13} isotope as a tracer for transport studies in plants, G. S. RABIDEAU and G. O. BURR. (Univ. Minn.). (*Amer. Jour. Bot.*, 32 (1945), No. 7, pp. 349-356, illus. 7).—Methods are described for incorporating CO_2 enriched with tracer isotope C^{13} into plant tissue by photosynthesis and also for sampling plant tissue, burning tissue samples to CO_2 , and analyzing this gas for presence of the tracer element. Rapid transport of labeled photosynthate upward and downward to metabolically active regions such as the root tip and stem tip is shown. A correlation is indicated between the ratio excess of C^{13} and the rapidity of growth in the stem-tip region. Radioactive P passed through killed areas of bean stems; compounds containing C^{13} did not. Failure to find that any C^{13} tagged material moved upward or downward through stems killed with hot wax suggests that the exclusive path of transport of these materials is in the living tissues—probably the phloem. Lack of cross transport of labeled photosynthate to the opposite primary leaf was shown under conditions of light or darkness, feeding or starvation. Equal lateral distribution of new photosynthate was found in the stem of plants fed on only one side. There are 30 references.

Effect of light intensity, nitrogen supply, and fruiting on carbohydrate utilization by the cotton plant, F. M. EATON and N. E. RIGLER. (Tex. Expt. Sta.). (*Plant Physiol.*, 20 (1945), No. 3, pp. 380-411, illus. 8).—Greenhouse studies in winter and outdoor tests in summer indicated that the level of nitrate supply has—in itself—no outstanding effect on fruitfulness relative to plant size in cotton; raises from a low level resulted in increases of both vegetative growth and number

of bolls, but a toxically high concentration reduced both growth and number of bolls. At both light intensities—at midday, about 1,000 and 10,000 ft.-c., respectively—the plants on low nitrate (1 milliequivalent per liter) were less than half as large as those on 4 and 16 m. e. of nitrate, and those on high nitrate (64 m. e.) were about three-quarters as large. In both experiments the relative fruitfulness values for 1- and 64-m. e. plants were actually a little higher than those for plants supplied with 4 and 16 m. e. Under low light these values were 4.46, 3.47, 3.36, and 4.09 and under high light, 6.75, 6.42, 6.43 and 7.58 for the four respective nitrate levels. As to fresh weight, the 1- and 64-m. e. plants differentiated more nodes and flower buds than the other two groups and their shedding percentages were higher. At the respective nitrate levels, the fresh weight of stems and leaves in the low-light experiment were nearly the same as the corresponding weights under high light, but the high-light plants were far more fruitful. The mean temperatures in the two series were similar.

Each of the experiments included fruited plants and those from which all floral buds were removed as they attained a bract width of about 15 mm., the debudded plants being included to aid in differentiating the effects of treatment and of fruiting. Debudding resulted in an increased number of main stalk and fruiting branch nodes and in a large increase in the weight of stems and leaves. The latter was much less in the low- than in the high-light series, which accords with the lower weight of bolls under the low light. High nitrate was more toxic to fruited than to debudded plants. Carbohydrate concentrations were lowest in plants supplied with 4 m. e. of nitrate, lower in fruited than in debudded plants and under low than under high light, and lower in the leaves than in the root bark. Shedding of very small floral buds was a prominent feature in the growth of the fruited plants under low light at all nitrate levels, but bud shedding under high light was negligible in them, as well also as in the debudded plants under both light intensities. Square shedding thus occurred only from plants with the lowest carbohydrate concentrations. The 64-fold increase in N concentration in the substrate tended to double the N content of the leaves and to quadruple that in the root bark. Higher N concentrations were found in the debudded than in the fruited plants and also under high light than under low light. This accords with the extent of carbohydrate accumulation in the root bark.

The data on fruitfulness and on carbohydrates and N accumulation afford little or no basis for attaching special significance to carbohydrate:N ratios in cotton. Fruiting itself influenced this ratio as much as did the nitrate supply; the actual magnitudes of the carbohydrate and N concentrations, however, were both informative. In both experiments it appeared that limited carbohydrate supply was responsible for much of the boll shedding. In the high-light plants, however, sugar and starch concentrations were 2.7 times as high as in the low-light plants. The fact that carbohydrate concentrations were not reduced in the high-light plants to levels found in the low-light plants before shedding occurred was interpreted as indicating that high light sets in motion some factor that depresses carbohydrate utilization. Fruiting activities had a greater dominance over vegetative growth under high than under low light. There are 35 references.

Wounding and sugar translocation, F. W. WENT and M. CARTER (*Plant Physiol.*, 20 (1945), No. 3, pp. 457-460).—Cutting off the leaves of tomato plants close to the path of food movement seemed to inhibit sugar translocation in the stems. Pinching off the leaves appeared to interfere less with sugar translocation than cutting them off with a sharp knife.

Growth in vitro of excised tobacco and sunflower tissue with different temperatures, hydrogen-ion concentrations, and amounts of sugar, A. C. HILDEBRANDT, A. J. RIKER, and B. M. DUGGAR. (Wis. Expt. Sta.). (*Amer. Jour. Bot.*,

32 (1945), No. 7, pp. 357-361, illus. 4).—Certain environal factors influence the growth of excised tobacco and sunflower callus tissue in vitro. When both tissues were cultured at 4°-37° C., the optimum range for tobacco tissue was found to be about 26°-32° and that for sunflower tissue about 24°-28°. Best growth of tobacco tissue occurred on media with original acidities averaging pH 5.0-5.4 and final acidities of pH 5.5-5.9. Sunflower tissues grew best on media with original acidities averaging pH 5.5-5.9 and final acidities of pH 6.0-6.4. When progressively increasing amounts of sucrose were added, respectively, to different lots of the basic medium, both species grew best with a 1 percent concentration and did well at 0.5-2 percent. There was some growth at 4 and 8 percent, but no growth at 16 percent or on media lacking sugar. There are 22 references.

On the exudation of nucleotides and flavanone from living roots, II. LUNDEGÅRDH and G. STENLID (*Arkiv Bot.*, 31 (1944), No. 3, [Art. 10], pp. 1-27, illus. 12).—In previous studies (about one page of references) it has been noted that living roots always exude small amounts of organic substances. This fact opens up the possibility of investigating the surface layer of the exuding cells, since all exuded substances must pass through the protoplasmic membrane and contribute to its physical and chemical properties. The normal exudation is looked upon as a kind of mild extraction under physiological conditions. Owing to the very small amounts of organic substances normally exuded, microchemical or preferably spectrochemical methods were used in this study; as a complement certain biochemical tests were also performed. Preliminary experiments showed that exudation increased in slightly acid solutions, but in most of the work the roots were treated with distilled water only at about pH 5.6, in which exudation of salts, sugar, nucleotide, and flavanone took place. Most of the experiments were performed with roots of young seedlings 2 to 4 days old, grown under sterile conditions. This study included the identification of nucleotides and of flavanone, the influence of pH on the absorption spectrum of wheat root exudate and on the exudation process, and the influence of cations on exudation from roots of pea seedlings. The findings are discussed in relation to the properties of the protoplasmic surface, the possible biochemical function of a flavanone-peroxidase system, and the possible ecological importance of the root exudate.

A note on the presence of pyruvic acid in Ebenezer onions, E. BENNETT. (Mass. Expt. Sta.). (*Plant Physiol.*, 20 (1945), No. 3, pp. 461-463).

An experimental analysis of alkaloid production of *Nicotiana*: The origin of nornicotine, R. F. DAWSON (*Amer. Jour. Bot.*, 32 (1945), No. 7, pp. 416-423, illus. 2).—In a study of alkaloid accumulation patterns in graft combinations involving *N. tabacum*, *N. glauca*, *N. glutinosa*, and tomato and in the hybrid *N. tabacum* × *N. glauca*, it was found that nornicotine is produced only in the plant leaf and at the expense of nicotine. This is taken to mean that, insofar as the three major *Nicotiana* alkaloids are concerned, only nicotine and anabasine are produced by total synthesis in situ. Nornicotine production is definitely secondary in nature. It is shown that—contrary to all reports—anabasine production does not predominate over nicotine production in the hybrid *N. tabacum* × *N. glauca*. Rather, nicotine is produced in the roots as might be expected, translocated to the leaves, and there converted to nornicotine. Failure to differentiate between nornicotine and anabasine in mixtures of the two is shown to account for the earlier erroneous reports. The same conclusion is shown to apply to alkaloid accumulation in *N. glauca* scions grown on *N. tabacum* stocks. The demonstration in this case that normal and predictable patterns of alkaloid synthesis and accumulation prevail removes the necessity for explaining the results of grafting experiments by recourse to other than well-recognized biological and biochemical principles. It is shown that existing data in the literature concerning the inheritance of *Nicotiana* alkaloids

in interspecific hybrids other than those here discussed can be readily explained by postulating the inheritance of a mechanism for conversion of nicotine to nornicotine in the leaves. It is suggested that this mechanism is concerned with a transmethylation reaction. Finally, a completed picture of alkaloid production, translocation, accumulation, and transformation with respect to nicotine, nornicotine, and anabasine in *N. tabacum*, *N. glauca*, and *N. glutinosa* is given. The inherent unity in these processes is indicated. There are 18 references.

The respiration of growing plant cells, W. DONNELLY and W. A. BECK (*Plant Physiol.*, 20 (1945), No. 3, pp. 448-452, illus. 1).—The respiration of the growing cells of the sunflower hypocotyl was determined by a microrespirometer and the rate expressed in milligrams of O_2 per unit mass of protoplasm. The rate was found to decline with time for every section, doubtless resulting from the excised state. The highest respiratory rate was in the uppermost 2 mm., in which the embryonic cells occurred. The average rate declined successively in the zones from the youngest to the oldest, except in the third zone where the rate of cell enlargement is at a maximum. The respiratory rate was correlated with other growth phenomena, and it is suggested that auxin exercises an effect on the metabolic activity of the protoplasm.

The zonal graduation of respiratory intensity in the root, H. WANNER (*Arkiv Bot.*, 31 (1944), No. 3, [Art. 9], pp. 1-9).—The fact that active salt absorption by roots depends on their metabolic activity was established in the early investigations of the subject; this metabolism is most obviously reflected in respiration. Besides the fundamental problems involved, there arises the question of relative efficiencies in the different zones of the root in salt and water absorption; previous work along these lines and the methods used are briefly reviewed (11 references). For this investigation the small glass capillary method, with some slight modifications described, proved highly suitable. Studying the graduation of respiratory intensity in wheat roots by this procedure, the author found the greatest O_2 consumption per unit fresh weight to be exhibited by the zone of meristematic activity. The elongation zone had a somewhat lower O_2 requirement, and a marked minimum was characteristic of the root hair zone. The basal parts of the roots may have a somewhat higher O_2 consumption, which, however, never exceeds that of the apical parts. By dipping root pieces for 15 to 20 min. into glucose solution, then for a moment into distilled water and measuring respiration for an hour, it was found that only those parts covered by root hairs showed a significant response to the glucose feeding. Dipping root pieces for 30 min. in a neutralized solution of $M/200$ HCN caused a partial inhibition of their aerobic respiration. The decrease in O_2 consumption was not, however, the same in the apical parts as in the root hair zone. Repeated tests indicated that the inhibition of respiration in the apical zone was almost exactly 60 percent, while in the root hair zone it was 65 to 70 percent of the controls. The significance of the results is discussed briefly.

Respiration and germination studies of seeds in moist storage, L. V. BARTON (*Ann. N. Y. Acad. Sci.*, 46 (1945), Art. 4, pp. 185-208, illus. 3).—Physiological studies were made on imbibed seeds (*Amaranthus retroflexus*, *Impatiens balsamina*, and *Rumex obtusifolius*) which remain viable but without germinating over long periods. Gaseous exchange in *A. retroflexus* seeds, measured at intervals of 0 to 901 days of moist storage at $20^\circ C.$, showed at least a tenfold reduction in respiration, the beginning of which became apparent after 2 days and was definite after 8 days. Decreased respiration was also noted for *I. balsamina* seeds held moist at 20° for 28 to 365 days; with increased time in storage, the respiratory quotient decreased. Seeds of *A. retroflexus* held in moist storage showed a periodicity in germination apparently independent of external conditions, indicating varying degrees of the primary or the induced secondary dormancy of the original lot of seed.

Moist seeds held without germination at 20° could be induced to germinate at that same temperature by rubbing, by drying for 3 hr. to 3 days, or by exposure to 35° for 12 to 24 hr.; germination also proceeded immediately after removal to higher constant or alternating temperatures. Moist seeds of *R. obtusifolius* held without germination at 30° could be made to germinate at this same temperature by removing the coats, treatment with concentrated H₂SO₄ for 2 min., or exposure to 5° for 4 days. On removal from 30° to lower constant or daily alternating temperatures, germination proceeded without further treatment.

Action spectrum for the photoperiodic control of floral initiation in Biloxi soybean. M. W. PARKER, S. B. HENDRICKS, H. A. BORTHWICK, and N. J. SCULLY (U. S. D. A.). (*Science*, 102 (1945), No. 2641, pp. 152-155, illus. 3).—The effectiveness of light applied to Biloxi soybean leaves during the middle of the dark period to prevent floral initiation was determined at various wavelengths; the results constitute the action spectrum from which knowledge is obtained about photoreactions of unknown compounds regulating floral development. A study of the effect of various wavelengths of visible light on the dark period interruption was made with the specially designed spectrograph described—unique in that it provided a spectrum wide enough to permit irradiation of fully expanded leaflets while maintaining spectral purity at high intensity. Most experiments included five treatments differing in energy of irradiation, which was varied by varying the time of exposure at constant intensity, since it had been found by preliminary tests that at a given wavelength the minimum energy required to prevent floral initiation—at the middle of the dark period—was independent of the variations of time and intensity of irradiation so long as their product was a constant. Results for many experiments have been combined in a curve, covering the region from 3,800 to 7,200 a. u.; the region from 7,200 to 20,000 a. u. was also investigated, but floral initiation was not inhibited beyond 7,200 a. u. Floral initiation can be suppressed by interrupting the dark period with light of sufficient energy from any region of the visible spectrum, but there are two regions of maximum efficiency, one in the yellow, orange, and red and the other in the violet near 4,000 a. u. The over-all response curve had striking similarities to the curve for photosynthetic utilization of CO₂. In particular it exhibited the same action limit in the red and two maxima, one in the red and the other in the blue. The curve indicated that the chloroplast pigments of the leaf are associated with the dark period interruption reaction; carotenoids apparently are not involved in the light absorption responsible for the reaction. It is deemed possible that energy absorbed by the chlorophyll is transferred to a reaction leading to the destruction of a material determining floral initiation; this may be a photo-oxidation. The response of *Xanthium pennsylvanicum* in the red was found similar to that of Biloxi soybean.

Notes on the effect of day length on potato yields. R. W. RAYNER (*East African Agr. Jour.*, 11 (1945), No. 1, pp. 25-28).—Responses of the potato are seen not to be specific and unmodifiable, but to vary with temperature and also—it is believed—with the high light intensities of the East African highlands. Different varieties probably have differing requirements, and the yields of at least some appear not to be depressed by a 10-hr. day; in other words, the potato is not considered a strictly long-day species.

A schedule including cold treatment to facilitate somatic chromosome counts in certain forage grasses. H. D. HILL and W. M. MYERS. (U. S. D. A. et al.). (*Stain Technol.*, 20 (1945), No. 3, pp. 89-92, illus. 2).—Low temperature pre-treatment of root tips of grass grown from tillers in small beakers was found to contract somatic chromosomes and thus facilitate determination of chromosome numbers. A modification of Randolph's infiltration and card technics was adapted to working with root tips from large numbers of plants.

Schedules for sectioning maize kernels in paraffin, J. E. SASS. (Iowa Expt Sta.) (*Stain Technol.*, 20 (1945), No. 3, pp. 93-98, illus. 1).—A detailed technic is presented for paraffin-sectioning of kernels of corn said to be suitable for those as old as 50 days after pollination; the process described is based on experience with dent, waxy, flint, and sweet corn, and popcorn.

A contribution to the cytology of the Australian-South Pacific species of *Nicotiana*, H.-M. WHEELER. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 31 (1945), No. 7, pp. 177-185).—The 15 species of *Nicotiana*, or the *Suaveolentes* section of the subgenus *Petunioides*, from this region are a geographically isolated group of complexly interrelated species, the specific differences of which are generally small; 13 were studied cytologically. Considerable to high pairing between species obtains throughout the first meiotic metaphase as shown in 26 hybrids involving 12 species; this indicates a common origin. A phyletic hypothesis involving a base number of 8 and repeated hybridization, in part accompanied by chromosome doubling, is offered as a possible interpretation of the chromosome number, morphology, and behavior in the *Suaveolentes*. There are 18 references.

Growth and vascular development in the shoot apex of *Sequoia sempervirens* (Lamb.) Endl.—II, Vascular development in relation to phyllotaxis, C. STERLING. (Univ. Calif.). (*Amer. Jour. Bot.*, 32 (1945), No. 7, pp. 380-386, illus. 4).—A continuation of this histological study (E. S. R., 93, p. 262).

The origin and distribution of the endodermis in *Iris versicolor*, M. M. FLAMMAN (*Univ. Pittsburgh Bul.*, 41 (1945), No. 4, pp. 120-124).

Embryology of the tung tree, L. P. MCCANN. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 71 (1945), No. 5, pp. 215-229, illus. 4).—A study of the terminal buds, flowers, and fruit was made on samples collected in Louisiana during September 1938-June 1942. The tung ovule is anatropous, except that the nucellus protrudes through and beyond the micropyle. The megaspore mother cell is hypodermal in origin and subsequent divisions result in forming a normal 8-nucleated embryo sac. The egg nucleus is fertilized in 24 to 36 hr. after pollination and then rests for 1 to 2 weeks before dividing. At 2 to 4 weeks after pollination embryos were in the 8-cell stage; most of them were in the 32-cell stage at 6 to 10 weeks after pollination, since there is a short rest period at this stage of development—the latter part of May to early June. Rapid cell division of the embryo begins after July 1, and full size is attained by late August. Endosperm development begins about 52 hr. after pollination with the first division of the 3n fusion nucleus. Subsequent development occurs slowly until about mid-June. Rapid endosperm development is concurrent with that of the embryo and both fill the seed by late August. Morphological details of the formation as well as the physiological functions of the various tissues are discussed.

Floral morphology of *Chrysothamnus nauseosus speciosus*, E. SNOW (*Bol. Gaz.*, 106 (1945), No. 4, pp. 451-462, illus. 56).—This shrub is said to be potentially of economic importance as a source of rubber in the western United States; it grows to a height of 2 to 6 ft. and is a subclimax dominant of the sagebrush-wheatgrass association. Blooming occurs through September-October; the yellow flower heads are rounded, usually consisting of five disk flowers with no rays. The flower bud primordia appear during the latter part of August, and fertilization follows early in October; the floral organs develop in the sequence—corolla, stamens, pappus, and pistil. The marginal cells of the corolla lobes curve inward at an early stage, interlock, and cause fusion of the lobes; later the elongation of the stamens forces the flower open. Further details in the morphology and development of the reproductive organs are presented and illustrated.

GENETICS

New combinations of genes in wheat X wheatgrass hybrids, L. P. REITZ, C. O. JOHNSTON, and K. L. ANDERSON. (Kans. Expt. Sta. and U. S. D. A.). (*Kans. Acad. Sci. Trans.*, 48 (1945), No. 2, pp. 151-159, illus. 3).—Tests of hybrids involving *Agropyron elongatum*, *A. glaucum*, and *A. trichophorum*, and wheat (*Triticum* spp.) indicated that grass-like perennial types are more readily selected than perennial wheatlike forms, larger seed size on grass types may be achieved, and potential disease resistance of a high order may be transferred to 28- and 42-chromosome wheats. See also a note by Armstrong (E. S. R., 93, p. 569).

Inheritance of stem characters in certain sorghum varieties and their hybrids, A. M. SCHLEHUBER. (U. S. D. A.). (*Jour. Hered.*, 36 (1945), No. 7, pp. 219-222, illus. 2).—In the cross of Collier sorgho (juicy) X *Sorghum vulgare*, M. N. 352 (dry) (a grain sorghum), juiciness of F_1 was intermediate between the two parents. In the lower internodes, F_1 weights exceed either parent, but in the upper internodes they approximate those of *S. vulgare*. The F_1 growth pattern, expressed in relative length of internodes, was different from either parent. In Straightneck X Collier, two juicy, sweet-stalked sorghos, juice quality, as expressed by percentage total solids and percentage sucrose of F_1 was lower than of either parent. In amounts of total solids and of sucrose per stalk, however, the F_1 approximated the mean of the two parents. In Honey Dew Drip X Collier, M. N. 258, both juicy-stalked, the F_1 exceeded either parent in both average stalk weight and quality of juice.

Breeding for resistance to late blight in the potato, F. J. STEVENSON, E. S. SCHULTZ, R. V. AKLEY, and L. C. CASH (U. S. D. A.). (*Amer. Potato Jour.*, 22 (1945), No. 7, pp. 203-223).—This program of breeding potatoes resistant to *Phytophthora infestans* was begun 12 yr. ago by the U. S. Department of Agriculture in cooperation with the Maine Experiment Station; several progress reports have been made, and this paper brings the work to date and discusses some of the newer family lines and potential commercial selections. Varieties exhibiting ranges of reaction from susceptibility to immunity have been used in this project. A few seedlings with intermediate type of resistance were produced by crossing two susceptibles, and a much larger percentage of intermediates were produced when intermediates such as President and its relatives were used as parents of selfed lines and crosses. The intermediates from the latter series of progenies were all late, and none of them proved superior in other characters to Sebago. Selection from the original introductions of the so-called *H'* races from Germany exhibited a high degree of resistance but were all low in yields and market quality. When some of these were crossed with American varieties and seedlings, a number of selections from the resulting progenies retained the blight resistance of their foreign parents and were much more desirable commercially. A number of these selections were in turn selfed, sib-mated, and outcrossed to various commercial varieties and promising seedlings. From this second series of progenies selections highly resistant to blight were made and in preliminary trials showed yields and dry-matter contents of tubers equal to the best commercial varieties grown in Maine. Some of them were very early and still others were late. In several progenies segregating for both characters, no significant correlation was found between season of maturity and resistance to late blight. It should not be long before one or more of the most resistant of these seedling varieties is named and distributed to growers who at present suffer severe losses from late blight despite attempts to control it.

Adaptive isochromosomes in Nicandra, C. D. DARLINGTON and E. K. JANAKY-AMMAL. (*Ann. Bot. [London]*, n. ser., 9 (1945), No. 35, pp. 267-281, illus. 10).—All varieties of apple of Peru normally have nine pairs of autosomes and one pair of isochromosomes ($2n = 20$). At meiosis the isochromosomes pair either inside to

give univalents or outside to give bivalents, or both. When univalents are lost, the pollen and eggs formed lack an isochromosome altogether. The deficient pollen dies, but the deficient eggs must be fertilized since seedlings of delayed germination include a portion lacking one isochromosome ($2n = 19$). Slight polypmitosis of the pollen occurred in one diploid and binucleate pollen in another. Tetraploids with four isochromosomes ($2n = 40$) showed the expected configurations and chiasma frequencies. The isochromosomes—as in diploids—had an advantage of pairing inside over outside; the attachment of the arms thus facilitates inside pairing. A triploid had asynapsis of the autosomes with normal chiasma formation in the isochromosomes; this is attributed to an accentuation in the advantage of attached arms as partners where there is a time limit to pairing. The value of isochromosomes to *Nicandra*—as of B chromosomes to corn—lies in securing heterogeneity. In *Nicandra*, however, this is a means of survival of the species rather than of the individual, for the delayed germination which reduces the survival value of the deficient individuals increases the survival value of the species producing them.

The mechanism of colchicine-induced cytohistological changes in cranberry, H. DERMEN. (U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 7, pp. 387–394, illus. 8).—Stating that the colchicine treatment of cranberry plants results mostly in chimeric polyploids of sectorial or periclinal type, the author discusses the results of a study of the cellular structure and changes underlying the development of polyploid tissues. Polyploidy resulting from colchicine treatment may be classed as apical and axial. Apical polyploidy results in continuous polyploidy in that portion of the growing stem resulting from the central cells that were polyploidized. Axial polyploidy is localized and limited in extent. Axial polyploidy changes to apical only when buds arise in the polyploid tissue.

The relation of growth to size in cucurbit fruits, E. W. SINNOTT (*Amer. Jour. Bot.*, 32 (1945), No. 7, pp. 439–446, illus. 7).—Studies of a number of inbred lines of cucurbits grown in three locations, Woodbury and New Haven, Conn., and Falmouth, Mass., showed growth in all cases to consist of an initial phase of constant exponential rate followed by one of gradual decrease. Final fruit size had little relation to rate of growth but was determined chiefly by duration of growth. In large fruited races each portion of the growth cycle was of longer duration than in small fruited ones. There were slight inherited differences in growth rate between the various lines. Environment affected growth rate and duration, but fruit size much less. There was observed little evidence of heterosis in fruit size, the F_1 fruits in general being not far from the geometric mean of their parent types. In three lines, there was no constant difference in fruit growth between diploid and tetraploid races. Genetic factors for fruit size may operate by controlling the production or destruction of physiologically active substances necessary for fruit growth.

Further studies on the chiasmata of the *Allium cepa* X *A. fistulosum* hybrid and its derivatives, S. L. EMSWELLER and H. A. JONES. (U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 7, pp. 370–379, illus. 2).—Continued investigations (E. S. R., 74, pp. 184) show that in *A. fistulosum* the chiasmata of the metaphase bivalents are located one on each side of the centromere, resulting in a cruciform configuration differing considerably from the rings and rods found in *A. cepa*, in which the chiasmata are all randomized. In hybrids between the two species the chiasmata are all randomized as in *A. cepa*. A 1:1 ratio of randomized to localized plants in backcross populations is believed to be the result of elimination of most gametes not predominantly *A. fistulosum* or *A. cepa*. In many of the plants from the backcross to *A. fistulosum* some bivalents may have either randomized or localized chiasmata, a situation resulting probably from the pairing between an *A. fistulosum* chromosome and a post-meiotic chromosome from the hybrid. First backcross plants that have predominantly localized bivalents give progeny with a similar type of chiasmata. This was true also for plants with randomized chiasmata.

Genic control of biochemical reactions in *Neurospora*. N. H. HOROWITZ, D. BONNIR, H. K. MITCHELL, E. L. TATUM, and G. W. BEADLE (*Amer. Nat.*, 79 (1945), No. 783, pp. 304-317, illus. 2).—On the basis of this critical review of studies on *Neurospora* by the authors and others (19 references), it is believed that two main conclusions may be drawn. First, the synthesis of the essential chemical constituents of living matter is under genic control. The hypothesis that the primary action of the gene has to do with the synthesis of enzymes which direct the chemical activities of the cell seems capable of explaining not only the mutations in this fungus genus, but many other genetic data as well. The second conclusion is that a one-to-one correspondence exists between gene and chemical reaction; it follows that the number of genes concerned in synthesizing a single substance approaches the number of chemical steps involved. Studies of the *Neurospora* mutants has made it possible in a number of cases to assign definite reactions to individual members of a series of nonallelic genes.

Heterokaryosis and the mating-type factors in *Neurospora*. E. SANSOME (*Nature [London]*, 156 (1945), No. 3950, p. 47).—"The difference between a homothallic species such as *N. tetrasperma* and a heterothallic species such as *N. crassa* appears to be that in the former nuclei containing the mating-type factors are attracted at all stages in their life history, whereas in the latter they are repelled or kept apart until the time of sexual reproduction."

Tetraploid *Taraxacum kok-saghyz*.—I, Characters of the leaves and inflorescences in the parental colchicine-induced generation. M. W. BANNAN (*Canad. Jour. Res.*, 23 (1945), No. 4, Sect. 4, pp. 131-143, illus. 22).

[The genetics of fungi and bacteria] (*Genet. Soc. Amer. Rec.*, 13 (1944), pp. 20-21, 25-26, 41-42).—Abstracts of the following papers are included: The Effect of Ultraviolet Radiation and X-rays on Mutation Production in *Penicillium notatum*, by A. Hollaender and E. M. Zimmer; Heterokaryosis and Heterosis in the Fungi—Their Biological and Industrial Significance, by C. C. Lindegram; Mutations of Bacterial Viruses and of Their Bacterial Hosts, by S. E. Luria; and "Mutations" and Cell Divisions in Bacteria, by S. Zamenhof.

Annual review of biochemistry, XIV, edited by J. M. LUCK and J. H. C. SMITH (*Stanford University, Calif.: Ann. Rev., Inc.*, 1945, vol. 14, pp. 856+, illus. 3).—Among the articles included in this book are: Biological Oxidations and Reductions, by H. A. Lardy and C. A. Elvehjem (pp. 1-30) (Univ. Wis.); Water-Soluble Vitamins, by L. C. Norris and G. F. Heuser (pp. 469-524) (Cornell Univ.); Fat-Soluble Vitamins, by J. C. Fritz (pp. 525-560); and Animal Pigments, by H. F. Holden (pp. 599-616). Extensive bibliographies are presented.

What and when is a mutation? I. J. COLE. (Univ. Wis.). (*Amer. Jour. Breeder*, 18 (1945), No. 1, pp. 6-12, illus. 1).—The essentials of transmission of dominant and recessive genes.

Genetic differences between two breeds of dairy cattle as shown by incidence of cellular antigens. R. D. OWEN, C. STORMONT, and M. R. IRWIN. (Univ. Wis.) (*Genetics*, 30 (1945), No. 1, pp. 16-17).—An extension of the study previously noted (F. S. R., 92, p. 639) is given, with a total of 1,305 Guernsey and 875 Holstein-Friesian cattle. Each of the antigens was encountered in both breeds. The differences in the blood phenotype between the two breeds rests on contrasting frequencies of common genes rather than on the fixation of alternative alleles.

Effect of inbreeding on the growth curves of height at withers, weight, and heart girth of Holstein females. G. A. BAKER, S. W. MEAD, and W. M. REGAN. (Univ. Calif.). (*Jour. Dairy Sci.*, 28 (1945), No. 8, pp. 607-610).—Suitable mathematical and statistical techniques have shown a significant proportionate decrease in height, weight and heart girth of the daughters of Bear Valley Ormsby Esther 518683 with increasing values of *F*.

Studies of fat and carbohydrate oxidation in mammalian spermatozoa. H. A. LARDY and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Arch. Biochem.*, 6 (1945), No. 1, pp. 53-61).—Experiments were undertaken to determine which intermediary metabolites could be utilized by bull spermatozoa and whether the utilization of any of these would be prevented by malonate. Comparative data were obtained on the effect of 2,4-dinitrophenol on the utilization of the various metabolites. The hypothesis that fats as well as carbohydrates are metabolized through the isocitric acid cycle was supported by the following findings: "Glucose, pyruvate, *l*-lactate were utilized by epididymal, and by malonate-treated, and 2,4-dinitrophenol-treated ejaculated spermatozoa. Succinate, fumarate, malate were not utilized by ejaculated bull spermatozoa. These 4-carbon acids and oxalacetate were effective in reversing malonate inhibition of motility and respiration. Oxalacetate improved motility and respiration of normal bull spermatozoa and was the only 4-carbon dicarboxylic acid effective in increasing respiration and supporting motility of dinitrophenol-treated spermatozoa. Its efficacy may have been the result of decarboxylation to pyruvate, which is utilized in both cases. Egg phospholipids increased respiration and prolonged motility but were without effect on malonate or dinitrophenol inhibition of endogenous respiration and motility. Acetate, acetoacetate, and β -hydroxybutyrate did not stimulate respiration but prolonged maintenance of motility. They support both respiration and motility of dinitrophenol-treated spermatozoa. β -Hydroxybutyrate alone, among these fat intermediates, consistently increased respiration and improved motility of malonate-treated spermatozoa. It seems probable that the oxidation of β -hydroxybutyrate to acetoacetate supported motility in this case. Acetoin, propionate, butyrate, α -glycerophosphate, α -hydroxyisobutyrate, *d*-lactate were not utilized for the maintenance of motility. Spermatozoa and enzyme preparations therefrom can synthesize citric acid from pyruvate or oxalacetate under certain conditions. The enzyme aconitase is present in acetone-dried spermatozoa and may be extracted into aqueous solution."

The metabolism of bovine epididymal spermatozoa. H. A. LARDY, R. G. HANSEN, and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Arch. Biochem.*, 6 (1945), No. 1, pp. 41-51).—Study of the metabolism of bovine epididymal spermatozoa showed that the motility after removal from the epididymis was hastened by aeration and could be prevented by the addition of cyanide to the medium. Freshly removed epididymal spermatozoa incubated aerobically esterified inorganic phosphate to produce an ester which appeared to be adenosine triphosphate. "Both the oxidation of the endogenous lipid stores and the glycolysis of glucose are independently coupled with this esterification." Rates of respiration and aerobic glycolysis of epididymal sperm are much lower than those of ejaculated bull spermatozoa. Both aerobic and anaerobic glycolysis are stimulated by bicarbonate. "Bovine epididymal spermatozoa utilize pyruvate, *l*-lactate, a number of intermediates of Krebs' isocitric acid cycle, acetate, acetoacetate, β -hydroxybutyrate, and egg phospholipids under aerobic conditions for the maintenance of motility. Epididymal bull spermatozoa (like the ejaculated sperm) glycolyze glucose, fructose, and mannose at about the same rate. The epididymal sperm differs from the ejaculated sperm in that it can utilize maltose only at an extremely slow rate." There is an increased endogenous rate of respiration of epididymal sperm resulting from storage and excised epididymides in a refrigerator for 1 to 2 days. Epididymides from a local packing plant were removed within an hour of slaughter and kept in a refrigerator. The spermatozoa were removed in physiological saline. Experimental details were essentially as described (E. S. R., 89, p. 530).

The factor in egg yolk affecting the resistance, storage potentialities, and fertilizing capacity of mammalian spermatozoa. D. T. MAYER and J. F. LASLEY. (Mo. Expt. Sta. et al.). (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 261-269, illus. 1).

—In further study of the factor in egg yolk affecting the storage of spermatozoa, as discussed by Lasley et al. (E. S. R., 92, pp. 357, 642), division of spermatozoan resistance into two distinct types is suggested and the relation of each to problems of reproductive physiology is discussed. A chemical procedure is presented for the isolation of an active resistance factor from egg yolk by drying and extraction with acetone, alcohol, and ether, leaving a residue of but 34 percent of the dried egg yolk. This factor was a water-clear solution in phosphate buffer and proved more effective than the original egg-yolk buffer mixture in increasing the resistance of spermatozoa to adverse conditions. The increased effectiveness may result from the removal of the alcohol-soluble fraction which is detrimental to the spermatozoan viability. Further identification of the factor present in the active fraction and knowledge of the mechanism influencing spermatozoan resistance should aid in the solution of some problems of reproductive physiology and make definite contributions to the knowledge of general cellular physiology. References to papers of the Missouri Station on the use of egg yolk for preservation of viability of sperm are rather complete.

Livability and glycolysis of bovine spermatozoa in yolk-citrate, incubated eggs, or chick-embryo diluters, G. W. SALISBURY, J. A. ZELAYA, and N. L. VANDEMARK. (Cornell Univ.). (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 270-276). —In two experiments the value of chick embryo diluter made from whole fertile eggs incubated 9 to 11 days was only slightly superior to yolk citrate in maintaining livability of spermatozoa during low temperature storage. The difference was observed largely with semen samples of poor quality, which ordinarily would not be used in commercial artificial insemination. No difference was obtained in viability during storage of spermatozoa in semen of better than average quality between yolk citrate, chick embryo made from whole incubated eggs, and diluter from the embryos only. The chick embryo material aided in the promotion of glycolysis by the spermatozoa. Comparative studies were made of the rate and percentage motility and initial glucose level and the loss after storage of glucose and lactic acid from semen diluted with yolk citrate and whole embryo diluents. These studies included semen before and after storage for 2, 4, 6, 8, and 10 days at 5° C., and were conducted with 10 semen samples in the first and 11 in the second experiment, in which each of the methods of storage was employed.

Preliminary results of artificial insemination through a cooperative enterprise, W. W. SNYDER and A. C. BALTZER (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 310-312). —Over a 6-mo. period the number of herds and cows in a cooperative artificial insemination enterprise has more than doubled. The nonreturns of 53 percent of the cows in June increased to 70 percent in October. In the 5 mo. June to October there were 3,821 cow inseminations, of which 1,136 cows were second services. About 89 percent of all cows are thought to have conceived from these two services.

Hereditary forms of sterility in cattle: Biological and genetical investigations, I. K. ERIKSSON (*Lund, Sweden: Håkan Ohlssons Boktryck.*, 1943, pp. 155, illus. 10). —Sex gland hypoplasia seems to be an anomaly characteristic of improved Highland cattle. A circular tour was made of existing Highland breeding centers, and about 6,000 ♂♂ and ♀♀ were clinically examined for the existence of hypoplasia. The testicles of about 70 slaughtered bulls and the ovaries and uteri of 40 cows from the Oslo slaughterhouse and cooperative abattoir were examined histologically without finding any cases of hypoplasia, but it is not entirely unknown in other breeds from various regions and in several types of animals. In testicle hypoplasia, normal spermatogenesis does not occur. The epithelium layers of the seminal ducts and the follicles of the ovaries were more or less undeveloped, with a low percentage of fertilization occurring. Thus, testicular and ovarian hypoplasia may

vary in degree. Differences in the testicles and ovaries of the two sides are taken to indicate lateral hypoplasia. In the 135 normal ♀♀ examined, the left ovary was heavier than the right in 52 cases, with equality in 16 cases, and in 67 cases the right ovary was heavier than the left. Differences between the size of the two sides become more evident as age advances in both sexes. The localization of hypoplasia, especially in the left side in the Highland breed is a typical fundamental characteristic of the breed. Double-sided hypoplasia ♀♀ showed characteristic abnormalities in the primary and secondary sexual characters. One-sided hypoplastic bulls did not show as much development as normals, but the differences were small and not significant. One-sided hypoplastic cows had somewhat better body development than normals, except for height at withers. Differences were also small and not significant. Double-sided hypoplasts in both sexes are usually completely sterile, producing no viable gametes, although sexual instinct and copulation were at least normal. One-sided hypoplasts may have irregular reproduction from very good to sterile. Single-sided hypoplastic cows had a higher-than-normal fat content of the milk. There was no difference in the inbreeding between hypoplastic bulls, bulls apathetic in copulating, and normal bulls. The data indicate satisfactory agreement with the hypothesis of two recessive hypoplasia genes, which when separate cause single-sided hypoplasia and together double hypoplasia. From an inheritance point of view the right- and left-sided hypoplasia are similar without genetic influence as to side. Sex linkage was not an influencing factor. The frequency of hypoplasia is decreasing in the stock, but it is calculated that it will take three generations to reduce the frequency from 7.9 to 4.5 percent and about 19 generations (a century) to reduce the frequency to 0.5 percent.

The levels of ovarian hormones required to induce heat and other reactions in the ovariectomized cow, S. A. ASDELL, J. DE ALBA, and J. S. ROBERTS. ([N. Y.] Cornell Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 277-284).—An average level of 600 rat units of estradiol benzoate for 3 days was required to bring ovariectomized heifers into heat, which lasted for usually less than 1 day even though the injections were continued. In the normal cow the low threshold is probably reached early in the development of the Graffian follicle. "Estrous block," apparently in the central nervous system, then sets in, and the cow is out of heat before ovulation. The mean dose of stilbestrol needed to bring an ovariectomized heifer into heat is 0.255 mg. Uterine muscle of ovariectomized heifers is relatively inert, both spontaneously and to pituitrin, epinephrin, lentin, and arecolin. Uterine muscle of heifers estrogenized after ovariectomy has the same reactions as that of heifers in heat. Progesterone in doses of 35 rabbit units or more given for 6 days produced the same reaction of the uterine muscle as those found in heifers during diestrus. Given in doses of 18 rabbit units for 6 days, progesterone produced a diphasic response in the heifer to epinephrin, resulting first in a contraction, followed by relaxation, similar to that found in proestrus. In estrogenized heifers the average length of the uterine muscle cells is greater than in ovariectomized controls. At the levels given, proestrus did not inhibit the action of estrogen. "In domestic animals the level of FSH [follicle stimulating hormone] in the pituitary, the length of the heat period, and the estrogen threshold and excretion during heat are strikingly parallel; if one is high, the others are high, etc. The following descending order is in general shown: Man, horse, hog, sheep, cow." The connection between the low hormone threshold in the cow and the freemartin problem is discussed.

Yearly differences in growth of Navajo and crossbred ewe lambs, C. T. BLUNN. (U. S. D. A. et al.). (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 306-310).—The weights of Navajo and crossbred lambs raised at the Southwestern Range and Sheep Breeding Laboratory, Fort Wingate, N. Mex., were ascertained at 4-week

intervals from birth to 20 weeks of age from 1938 to 1941. The crossbreds varied more than the Navajos from 4 to 20 weeks of age. The variance averaged 14.2 percent for the Navajos and 37.4 for the crossbreds. The Navajos are smaller and have become more fully adapted to the southwestern region and climatic conditions than the improved breeds (Corriedale, Romney, Columbia, and Rambouillet), the breeds of rams used in crossing and backcrossing. There were no significant differences in growth between the various kinds of crosses used in any one year.

A new lethal in sheep: Nervous inco-ordination or paralysis at birth, K. RASMUSSEN (*Sci. Agr.*, 25 (1945), No. 8, pp. 482-488, illus. 6).—In Corriedale lambs there occurred a condition of paralysis. In 1942 there were 9 paralyzed and 28 normal lambs, definitely pointing toward a recessive gene as responsible for the lethal condition. All of the paralyzed lambs, many of which could not stand, were sired by the same ram. Matings of ewes that had produced paralyzed lambs back to the same sire produced 10 normal and 8 paralyzed in 1943 and 1944. The main characteristic of the abnormality was incoordination of muscular action causing lambs to be unable to stand. Modifying genes were evidently involved.

The respiratory metabolism of ram spermatozoa, H. A. LARDY, B. WINCHESTER, and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Arch. Biochem.*, 6 (1945), No. 1, pp. 33-40).—The oxygen consumption and motility of ram spermatozoa washed free of seminal fluid were investigated. There was considerable variation between rams and between samples in the same ram in the rate of respiration. Maximum respiration was obtained with a suspension medium of 6.5 to 7.5 pH, but motility was best retained at pH 7.25. The spermatozoa retained their original rate of respiration and motility when washed free of glucose and other seminal constituents and stored for several hours. Ram spermatozoa seemed to have a somewhat higher content of phospholipid than bull sperm (*E. S. R.*, 89, p. 530). The respiration was increased and motility prolonged by additions of pyruvate, succinate, or egg phospholipids. Sperm from certain ejaculates oxidized pyruvate at an extremely rapid rate, but motility was not improved, indicating that the rapid oxidation was not coupled with energy utilization.

Studies on the hormonal control of estrous phenomena in the anestrus ewe, H. H. COLE, G. H. HART, and R. F. MILLER. (Univ. Calif.). (*Endocrinology*, 36 (1945), No. 6, pp. 370-380).—Continuing previous investigations (*E. S. R.*, 75, p. 612), over 300 ewes were studied relative to the induction of estrus during anestrus. Of 118 ewes receiving a single injection of PMS (pregnant mare serum), estrus was produced in 8 within a 10-day period, but although all were bred none became pregnant, either after natural breeding or forced breeding. However, there is indication that a single injection may hasten the onset of the sexual season. Of 170 ewes receiving two injections of PMS at 17-day intervals, 58 came into estrus but only 17 of 53 which were mated became pregnant. Superovulation was produced with 600 to 750 International Units of PMS, as evidenced by the presence of as many as nine recently ruptured follicles and by an increased incidence of triplets. Estrogen in doses sufficient to induce sexual receptivity, alone or in conjunction with PMS, inhibited ovarian activity. Estrus was induced in 16 of 48 ewes receiving PMS supplemented with progesterone, but only 6 of 22 receiving PMS alone came into estrus. With two injections of both hormones, 5 of 9 mated as compared with 1 of 6 receiving only PMS. An effective means of inducing estrus was the combined treatment with testosterone propionate and PMS. Heat was induced in 39 of 48 ewes receiving androgen and PMS as compared with 24 of 54 ewes receiving only PMS, but the percentage of fertile matings was evidently reduced by the androgens. There was an unusual tendency of ewes in estrus to manifest homosexual behavior following treatment with androgen. As a cause of these irregular results, the conclusion was reached that either a proper balance of

hormones was not attained for a complete physiological response or unknown factors were involved.

Response of anestrous does and ewes to pregnant mare's serum during two consecutive seasons. A. H. FRANK, R. G. SCHOTT, and V. L. SIMMONS. (U. S. D. A.). (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 317-324).—In two comparisons with does (goats) and ewes in which the action of pregnant mare serum (PMS) in 1942-43, by Frank and Appleby (E. S. R., 89, p. 656), was studied, in the 1942 season 19 of 20 does came into estrus after one or more injections of PMS, but in 1943 only 6 of 56 does exhibited estrus following comparable treatment. In 1942, 6 of 14 ewes treated with PMS came into estrus and all had ovulated as ascertained by laparotomy. In 1943 only 2 of 26 came into estrus and 9 of 25 had ovulated when examined. The divergent responses of ewes and does in the different years are thought to result from different environmental or nutritional conditions.

Inheritance of coat color in swine.—III, Results of Landrace by Berkshire crosses. H. O. HETZER. (U. S. D. A. and Md. Expt. Sta.). (*Jour. Hered.*, 36 (1945), No. 8, pp. 254-256, illus. 1).—Continuing previous studies (E. S. R., 93, p. 703), in crosses to determine whether the Berkshire carries the same pattern gene as the Poland China there seems little doubt that both breeds carry the same fundamental gene, *Ep*, for black. Berkshire sows double-mated to Landrace and Berkshire boars produced 19 litters, of which 6 consisted of purebred pigs, 3 of crossbred pigs, and 10 litters were of both purebred and crossbred pigs. All of the 64 purebred pigs produced in the single- and double-mated litters showed the same color patterns as Berkshires. On the other hand, the 69 F_1 pigs were white or white with blue skin spots. In 19 F_2 pigs produced, there were 12 white and 7 black. From matings of Berkshire boars with F_1 sows, there were produced 11 black and 109 white. The Landrace white depends on the major dominant gene, *I*, epistatic to black of the Berkshire. The Berkshire has a more effective system of minor factors for extension of black than was found for the Poland China.

An appraisal of factors affecting prolificacy in swine. H. A. STEWART (Minn. Expt. Sta. coop. U. S. D. A.). (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 250-260, illus. 1).—"The effects of age and inbreeding of the dam and inbreeding of the litter on litter size were studied from intra line, intra year simple, and partial regressions calculated from the records of 749 inbred Poland China and Minnesota No. 1 gilts farrowing for the first time at approximately 1 yr. The relative effects of age, weight at breeding, gains made during pregnancy, and body length were determined from the data on 508 of the gilts. Litter size increased with an increase in the age of the dam at farrowing. The effect of age was much greater during the period prior to 12 mo. than later. Gilts farrowing at 320 days averaged 1 pig less, and those farrowing at 410 days about $\frac{1}{2}$ pig more than those at 1 yr. Litter size decreased with an increase in the inbreeding of the dam but apparently was unaffected by the inbreeding of the litter. An increase of 10 percent in the inbreeding of dams of the same age resulted in a decrease of about 0.6 pigs per litter. The heavier gilts at breeding, on the average, farrowed larger litters. The correlation between age and weight at mating was approximately 0.60. Body length may be associated with prolificacy, but errors in measurement conceal its value for use in selection. On the average, gilts making the greatest gains during pregnancy farrow the largest litters, but variations in gain may be an effect rather than a cause of variation in litter size. Age and weight at mating together account for 4 percent of the variance in size of first litters and together they provide the most reliable criteria for use in selection for fertility." An excellent bibliography is included.

A case of lateral asymmetry in the fowl. D. C. WARREN. (Kans. Expt. Sta.). (*Jour. Hered.*, 36 (1945), No. 8, pp. 226-231, illus. 2).—This asymmetry was found

in a fowl carcass in a packing house. Its breeding history was unknown, but the mosaic plumage, slate-colored legs, and other characteristics suggested it to be an Australorp-White Leghorn hybrid. Sexually it was intermediate. Size asymmetry was so extreme as to probably make it difficult for the bird to walk, but the carcass was in good condition. The chromosomal aberration influencing size also affects skin color and ear-lobe color.

Experiments in poultry-breeding, E. P. NIELSEN (*New Zeal. Jour. Sci. and Technol.*, 26 (1945), No. 5, Sect. A, pp. 271-281, illus. 4).—Fowls possessing characteristics of the parental breeds were developed from White Leghorns, Black Leghorns and Bantams. Autosexing breeds from the same sources were also developed from those carrying harring.

Survie des spermatozoïdes de coq dans divers milieux et à différentes températures [Survival of cock sperm at different temperatures], P. KOCH and E. ROBILLARD (*Rev. Canad. Biol.*, 4 (1945), No. 2, pp. 163-171, illus. 1; *Eng. abs.*, pp. 170-171).—The sperm of a cockerel could be kept alive for several days under paraffin at -2° C., but cooling must be done gradually. Bacterial contamination was the most serious factor in shortening the viability. The most successful diluting and activating agent tested was 2 percent of glucose in Ringer solution.

Studies on the mechanism of the hypercholesterolemia and hypercalcemia induced by estrogen in immature chicks, W. FLEISCHMANN and I. A. FRIED (*Endocrinology*, 36 (1945), No. 6, pp. 406-415, illus. 1).—When thyroxine and estradiol dipropionate were simultaneously injected into mature chicks, no increase in the serum calcium, cholesterol, inorganic phosphorus, lipid phosphorus, or protein phosphorus resulted. There was no inhibiting effect on growth of the oviduct due to estradiol dipropionate when the thyroxine was simultaneously injected with estradiol. A rise in the serum cholesterol without affecting other serum constituents was produced by the administration of the antithyroid drug thiouracil. Changes in serum cholesterol due to the administration of estradiol dipropionate or thiourea were not accompanied by changes in the total cholesterol content of the body, and are therefore not due to changes in synthesis or destruction of cholesterol but to alterations in the distribution of cholesterol between plasma and tissues. From the data presented, it seems probable that estrogen-induced increase in serum calcium is due to the formation of the organic phosphorus compounds necessary to bind the calcium. Thyroxine prevented this rise probably by inhibiting the formation or causing the destruction of these compounds.

FIELD CROPS

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), Nos. 6, pp. 1, 1, 7; 7, p. 8; 8, pp. 1, 2, 7, 8, illus. 2).—Progress results of investigations with field crops and related lines are reported in No. 6 in articles entitled: Cuttings Set in Field To Start Kudzu, by G. W. Johnston (p. 1); and High Dividends Received From Corn Fertilization: Nitrogen Usually Essential, by R. Coleman (pp. 1, 7); in No. 7, Ramie: Possible New State Crop for Bast Fiber, by J. F. O'Kelly (p. 8); and in No. 8, Early, Heavy Seedings, for Winter Crops, by H. W. Bennett (pp. 1, 8); Varieties of Small Grains Compared at Hill Stations, by J. F. O'Kelly (p. 2); Cotton Mechanization Studies at Stoneville (p. 7); and Excessive Erosion on Test Plots as Corn Blows Down, by R. Woodburn (p. 7).

Higher grain production with fertilization in the Upper Peninsula of Michigan, J. TYSON (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 4, pp. 390-397).—Field experiments in several soil types since 1928 showed that the production of barley and oats has been increased 50 to 100 percent by fertilizer treatments. In general, the largest yields were produced on land that received applications of 300 lb. per

acre of 4-16-4 and 4-16-8 fertilizers. The fertilizer evidently must carry enough soluble N to meet the demands of the young seedlings during the early, cold, wet spring season and to produce rapid early growth, and also enough P and K to meet the needs of the crop. It is deemed unwise to use fertilizers containing too high percentages of K as they delay ripening. Fertilizers were needed for grains after a heavily fertilized potato crop as much as after sod or other unfertilized crops. When no fertilizer was applied following fertilized potatoes, the grain ripened first in bands along the old potato rows with less mature bands between. When the grain was fertilized, the crop ripened uniformly.

Registration of varieties and strains of grasses, I. E. A. HOLLOWELL. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 8, pp. 653-654).—Alta fescue, a variety of tall fescue, approved for registration, is described with yield data from comparative tests.

Source of grass seed important for best reseeding of ranges, pastures, tests show, C. H. WASSER (*Colo. Farm Bul. [Colorado Sta.]*, 6 (1944), No. 6, pp. 10-13, illus. 1).—Blue grama grass seed from northern sources has been superior for seed production, and that from southern sources superior for forage production. Superior results may be expected by using seed from Flagstaff, Ariz., and adjacent regions of northeastern Arizona and northwestern New Mexico, the exact limits to be determined. Southern strains of smooth brome grass have produced more forage and more seed than northern strains in tests in cooperation with the U. S. Department of Agriculture. The Fairway strain of crested wheatgrass has been better adapted for cool, moist conditions such as in the higher mountain regions, while the standard strain is superior on the more arid sagebrush and shortgrass plains.

Improving California ranges, B. J. JONES and R. M. LOVE. (Coop. Calif. Expt. Sta.). (*Calif. Agr. Col. Ext. Cir.* 129 (1945), pp. 48, illus. 19).—The growth habits of range plants are described, and results of experiments on the effects of mowing and grazing on the establishment of seeded perennials and observations on management of brush fields are reported. Year-round feeding practices and the seasonal management of livestock are discussed. Recommendations on reseeding and brush and grazing management are summarized. Plants tested and other plants mentioned are listed with common and technical names. A list of 28 pertinent references is appended.

Sagebrush to grass: Rebuilding western range lands by eliminating sagebrush and planting grass (U. S. Dept. Agr., 1945, AIS-27, pp. 14+, illus. 12).—An illustrated account of the restoration of western range lands by eliminating sagebrush and planting suitable grasses, especially crested wheatgrass. General guides for reseeding are included.

Grazing on the cutover lands of western Washington: A preliminary report on the utilization of the non-restocking cutover lands of western Washington for grazing, T. W. DANIEL and M. E. ENSMINGER (*Washington Sta. Pop. Bul.* 179 (1945), pp. 44, illus. 10).—This preliminary report on the utilization of the nonrestocking cut-over lands for grazing, based on observations over much of western Washington and experiences of many individuals, considers present forage production on the cut-over lands, use of these lands for grazing, regional differences in relation to grazing possibilities, conversion of cut-over land to pasture, management of seeded cut-over lands, livestock management practices, the economics of cut-over land grazing development, classification of cut-over lands for grazing, and forestry v. grazing on the cut-over lands.

Development of a grazing economy depends upon the artificial establishment of permanent pastures because of the relatively short period during which cut-over land has appreciable natural carrying capacity after logging and the low natural carrying capacity of old cut-over lands. Successful pasture development depends pri-

marily on the kind of vegetation present on the area where pasture is wanted, with the risk of conversion probably least for dense brush and much greater for dense ferns; seed-bed preparation which seems to depend upon a successful fall burning of the accumulated debris and vegetative cover; fall seeding with a recommended mixture; proper management practices which include fencing of the seeded area and use of several kinds of livestock, with particular attention to the need for goats on brushy areas; and hay land sufficient to produce a ton of hay per animal unit for winter feeding.

Where a permanent ranch unit capable of carrying 500 sheep all year can be developed on the cut-over lands for an investment of about \$16,500, an Oregon station study in Coos and Curry Counties (E. S. R., 85, p. 549) indicates that such a development usually will be profitable. In Washington, the estimated cost of a ranch unit runs higher than the Oregon figure and the risks involved in conversion of cut-over lands can only be approximated. It is likely that where a grazing economy can be established on lands classed as poor for tree growth or on the average site in a non-restocking condition however, the returns from grazing in dollars per acre will probably exceed the returns from growing trees and come sooner.

The chemical composition of native forage plants of southern Alberta and Saskatchewan in relation to grazing practices, S. E. CLARKE and E. W. TISDALE (*Canada Dept. Agr., Tech. Bul. 54 (1945), pp. 60, illus. 12*).—A third contribution to the program (E. S. R., 89, pp. 204, 536).

Preliminary grazing trials in Trinidad, K. R. M. ANTHONY and J. D. HUNTER-SMITH (*Trop. Agr. [Trinidad], 22 (1945), No. 8, pp. 143-145, illus. 7*).—Guatemala grass was found to be unsuitable for forage. The thick, stout midribs made it extremely difficult for cattle to break off leaf blades, and this, combined with the shallow rooting system and insecure attachment of tillers, led to uprooting. Grazing resulted in reduction of tillering and severe stool mortality. Four $\frac{1}{4}$ -acre elephant grass paddocks were grazed rotationally. Grazings began when the grass was between 5 and 6 ft. high and it was eaten down to between 2 and 3 ft. Any one paddock was grazed in 2 to 4 days, but no damage to stools resulted from grazing or trampling. *Indigofera endecaphylla* interplanted between elephant grass stools showed great promise, but difficulty of maintaining a pure stand was evident.

Alfalfa varieties in the United States, H. L. WESTOVER (*U. S. Dept. Agr., Farmers' Bul. 1731, rev. (1945), pp. 17-1, illus. 5*).—This revision by H. M. Tysdal of Farmers' Bulletin 1731 (E. S. R., 72, p. 319) brings up to date available information on the status of alfalfa varieties and includes descriptions of the new varieties Ranger, Buffalo, Atlantic, and Nemastan.

Registration of varieties and strains of alfalfa, I, E. A. HOLLOWELL. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 37 (1945), No. 8, pp. 649-652*).—Ranger, a synthetic variety (E. S. R., 92, p. 361) composited from five strains; Buffalo, a wilt-resistant selection (E. S. R., 93, p. 426) from Kansas Common; and Meeker Baltic, a selection from Baltic, all approved for registration, are described with yield data from comparative tests.

Alfalfa production investigations in New Mexico, G. STATEN, R. S. STROUD, and J. CARTER JR. (*New Mexico Sta. Bul. 323 (1945), pp. 30, illus. 7*).—Variety, cultural, fertilizer (E. S. R., 87, p. 368) and rotation experiments with alfalfa at the station and at Albuquerque (E. S. R., 89, p. 534) and Las Vegas (E. S. R., 93, p. 568) are reported, with practical suggestions.

New Mexico Common appeared to be adapted to practically all of the alfalfa-growing areas, although in southern New Mexico the nonhardy types, such as Hairy Peruvian, have in some tests produced a higher yield of coarser, stemmier hay. Hardy types as Ladak, Grimm, and Hardistan, have yielded less than New

Mexico Common but in general have had a higher percentage of leaves in the hay. In the uniform nursery at the station, New Mexico Common and A 114 Nebraska were outstanding in hay yields and showed fair tolerance to wilt. In the advanced strain test Atlantic, Buffalo, and Ranger, along with Orestan, A 114 Nebraska, and New Mexico Common, were outstanding for hay yield over 2-yr. on badly infected soil. In these two tests New Mexico Common was the only southwestern strain containing appreciable tolerance to wilt. Under dry-farming conditions in northeastern New Mexico, no differences in yields of varieties were secured. The general unsuitability of alfalfa as a dry-farming crop unless a favored location for runoff or diverted water is available was indicated.

An advantage of early-bloom over pre-bloom cutting was shown. Cutting at a later stage produced lower yields and poorer quality hay for the first 3 yr., but the stand remained vigorous one season longer. When the second crop was allowed to mature, other cuttings could be made at an earlier stage without injury. Renovating old stands of alfalfa lessened rather than increased hay yields or thickened stands. Over 2-yr. alfalfa-grass mixtures at State College and Albuquerque, respectively, produced 81 and 91 percent of the yields of alfalfa alone. Grazing pure stands of alfalfa, although practiced successfully by some growers, could not be recommended as a general farm practice.

Phosphate fertilizer (E. S. R., 87, p. 368) at the rate of 60 lb. of available P per acre each year is recommended for practically all soils that have produced any considerable amount of alfalfa. The average increase in yield of 4 yr. of cotton following 1, 2, 3, and 4 yr. of alfalfa in the rotation as compared with yields from continuous cotton was 23, 32, 39, and 45 percent, respectively. Total soil N contributed to the differences in cotton yields of the various treatments in 1944.

Alfalfa in eastern Washington, E. J. KREIZINGER and A. G. LAW. (Coop. U. S. D. A.). (*Washington Sta. Bul.* 462 (1945), pp. 32, illus. 5).—Alfalfa varieties; cultural and management methods; haying, pasture, and seed production practices; and control of insects and diseases, are recommended from prolonged station experiments and experience. The Ladak, Grimm, Turkestan, Northern-grown common, Ranger, Canadian Variegated, Cossack, and Baltic varieties, indicated as adapted in order of preference, are winter hardy and can endure low temperatures. In this area alfalfa should be spring seeded without a nurse crop on a well-prepared weed-free seedbed at the rate of 8 to 10 lb. per acre, mowed once or twice in the first summer to reduce weed competition, and older stands cut for hay at one-tenth to one-quarter bloom or grazed after the growth is 6 in. high. While old, thin stands to be used for growing seed should be cultivated to control weeds, renovation of old stands by cultivation or reseedling has not been profitable for hay production. Pure stands of alfalfa have furnished good pasture for poultry, turkeys, and hogs, while mixtures of alfalfa with smooth brome and crested wheatgrass have given excellent results in steer grazing trials (E. S. R., 92, p. 402). Alfalfa seeded in rows has produced more seed than solid stands unless the latter are very thin. Clipping in the prebud stage and taking the seed crop on the second growth has given the highest yield of seed.

Barley varieties registered, X. H. K. HAYES. (Univ. Minn.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 8, p. 645).—Reno, a six-rowed, lax-headed, winter variety excelling in Kansas and a selection from Southcentral barley was approved for registration (E. S. R., 91, p. 537).

Fertilization of blue grass pastures, C. W. MCINTYRE and A. C. RAGSDALE. (Coop. U. S. D. A.). (*Missouri Sta. Bul.* 488 (1945), pp. 15-20, illus. 1).—The early yield and palatability of bluegrass pasture at Hannibal 1933-39 were increased by N, which, however, affected the stand adversely in dry seasons. Superphosphate decreased the yield and dry matter content but conserved the stand. Potash in-

creased the yield of green and dry hay. Limestone depressed the percentage of dry matter in the early season and decreased the yield for the entire season. Additional nitrogen increased the yield in seasons of normal rainfall but decreased the stand in seasons of low rainfall. The increase was much greater when N was used with a complete fertilizer and limestone. Manure increased yield more than other treatments and was beneficial to the stand, particularly in dry seasons.

Seven questions to ask when you buy or sell shelled corn by grade (*U. S. Dept. Agr.*, 1915, *ITS* 32, pp. 161, illus. 7). Tests for fair and average samples, presence of insects, odors, moisture, weight per bushel, cracked corn and foreign material, and for damage and other colors are outlined together with grade requirements.

Desmodiums—"Alfalfas of the Tropics", R. L. SQUIBB (*U. S. Dept. Agr., Agr. in Americas*, 5 (1915), No. 8, pp. 151-153, illus. 3). Characteristics, merits for livestock, and propagation methods are discussed for several species of *Desmodium* under test in Costa Rica and El Salvador.

Registration of improved flax varieties, III, A. C. ARNY. (*Univ. Minn.*). (*Jour. Amer. Soc. Agron.*, 37 (1915), No. 8, pp. 616-618).--Flaxes approved for registration (E. S. R., 91, p. 538) are Arrow, a selection from Bison \times Renew; Renew, from Newland \times (Reserve \times Morye); and Koto, from (Reserve \times Morye) \times Bison.

Three introduced lovegrasses for soil conservation, F. J. CRIDER (*U. S. Dept. Agr. Cir.* 730 (1915), pp. 90+, illus. 30).--The native habitat conditions, major characteristics, climatic and soil adaptations, uses in rotation, orchard soil cover, and soil conservation and for grazing, responses to clipping, and cultural and seed production practices are set forth for weeping lovegrass (*Eragrostis curvula*) (E. S. R., 91, p. 542), Boer lovegrass (*E. chloromelas*), and Lehmann lovegrass (*E. lehmanniana*). These grasses, according to the data, have qualities which give them exceptional value for soil conservation uses, including restoration of vegetative cover to lands temporarily utilized under war conditions. The fact that they have proved relatively high in food value, palatable and nutritious when used at proper growth stages, and very productive of forage appears to give them definite value for livestock production, especially as spring and winter pasturage. References total 39.

Cultivation of milkweed, O. A. STEVENS (*North Dakota Sta. Bul.* 333 (1945), pp. 19, illus. 8).--Common milkweed (*Asclepias syriaca*), was grown in field plots at Fargo and Edgeley during 1943 and 1944. Observations and collections were made in other parts of the State on this species and showy milkweed (*A. speciosa*).

Growth from seeds was good in 1943, although poorer in 1944 due probably to late planting. Growth from 1-in. pieces of roots was irregular and unsatisfactory, yet stalks from these seemed to flower better in the second year than did those from seed. Flowering began June 24-30 and continued through July. No seed pods began to open until September 10 but the weather was cool and wet for some time previous to that date. Acre yields were at the rate of about 140 bu. of pods per acre and 1,400 lb. of dry stalks. Relative weights of seeds, pods, and floss, length of pods and floss, and circumference of pods, taken for about 50 lots of pods representing individuals or colonies, were all quite variable. Weight of 1,000 seeds varied indirectly with number per pod. Total weight of seed and of floss was more directly related to circumference than to length of pods.

Flower structure and pollination were studied in some detail. In about 1,500 flowers from various sources, natural pollination took place most commonly to the extent of 5 or 6 percent, with a maximum of 14.3. Insect pollination is essential, and the chief agents observed were flies of various species. The flowers produce abundant nectar and are visited freely by honeybees. Artificial pollination is considered a difficult operation.

Registration of varieties and strains of oats, XIV, T. R. STANTON. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 8, pp. 643-644).—Mission, the oats variety approved for registration (E. S. R., 91 p. 539) and described with a performance record, is a medium tall, early to midseason variety with plump white kernels derived from Markton × Victory. It is highly resistant to races of loose and covered smuts found in Montana, and is being increased for distribution to farmers for growing mainly on dry land.

[Soybeans and their products] (*Soybean Digest*, 5 (1945), Nos. 3, pp. 6-7, 9-14, illus. 7; 4, pp. 12-13, 16-17, 19, illus. 2; 5, pp. 15-16, 19, 25, illus. 4; 6, pp. 10-13, 14-15, 16, 18, illus. 7; 7, pp. 8, 22, 25-26, 28, illus. 2; 8, pp. 8, 9, 10-14, illus. 5; 10, pp. 8-10, 12-14, illus. 3).—Papers of interest to agronomists and other technologists included: Soybeans in the Land of Our Enemies, by W. J. Morse (pp. 6, 7) (U. S. D. A.); Some Recent Work on Inoculation, by L. W. Erdman (p. 7); Soybeans and Hay in Livestock Rations, by W. E. Carroll (pp. 9-10) (Univ. Ill.); Fertilizing Soys in North Carolina, by W. E. Colwell (pp. 11-12) (N. C. Expt. Sta.); Some Observations on the Development of Soybeans in Illinois, by W. L. Burlison (pp. 13-14) (Univ. Ill.); Cooperative Soybean Processing Mills, by E. G. Schiffman (pp. 12-13) (U. S. D. A.); Lincoln Out Ahead—Report of Indiana Yield Contest, by K. E. Beeson (pp. 16-17, 19); Boost Ohio Yields With Early, High-Oil Varieties, by D. F. Beard (pp. 15-16) (Ohio State Univ.); When to Plant in Mississippi, by R. B. Carr (p. 19) (U. S. D. A. coop. Miss. Sta.); Field Varieties at Minnesota Found Edible (p. 25) [Univ. Minn.]; Soys in the Orient, by W. J. Morse and P. H. Dorsett (pp. 10-12); Rock Phosphate as a Fertilizer for Soybeans, by H. J. Snider (pp. 12-13) (Univ. Ill.); 1944 Report From Missouri Soil Fertility and Soybean Production Program, by A. W. Klemme (pp. 14-15) (Univ. Mo.); Edible Soybeans, by E. P. Walls (pp. 16, 18) (Md. Sta.); The Soybean—Its New Importance in Virginia, by M. H. McVickar (pp. 8, 22) (Va. Sta.); Debitting Soybeans—A List of Patents for Removing the Bitter Taste From Soybeans, by A. K. Smith (pp. 25-26, 28) (U. S. D. A.); Soybean Growing in Canada, by F. Dimmock (pp. 8, 9); Soybean Oil—A Study of Edible and Industrial Uses, by O. H. Alderks (pp. 10-14); Processing Plant Considerations in Determining Size, Type, and Location, by J. H. Shollenberger and W. H. Goss (pp. 8-10) (U. S. D. A.); and Growing Soybeans in California, by B. A. Madson (pp. 12-14) (Calif. Sta.).

Whitewashing sugar beets to reduce sugar losses in storage, C. A. FORT and M. STOUT. (U. S. D. A.). (*Sugar [New York]*, 40 (1945), No. 9, pp. 34-40, illus. 2).—Sugar losses in lime-coated sugar beet roots and in uncoated roots when stored under conditions comparable to those existing on the surfaces of storage piles were compared, and the effect of whitewashing storage piles in reducing sugar losses also was determined in cooperative experiments 1941-44. For storage periods of a month or longer under fall weather conditions, conservation of sucrose attributable to coating roots or to whitewashing surfaces of storage piles amounted to about 8 lb. per ton for roots in the surface layer. Temperature differences between uncoated and coated sugar beets exposed as on the surface of beet piles were as much as 20° F. on clear days. Low sugar loss in whitewashed sugar beet roots apparently resulted from reflection of the sun's rays by the whitened surfaces with consequent lower internal root temperatures and reduced respiration. Sugar losses sustained by uncoated surface beets were large compared with losses in beets inside a storage pile, providing spoilage was not a factor. Beneficial effects of whitewashing a pile of sugar beets apparently are limited largely to a surface layer about 1 ft. deep. The relatively high sugar losses normally occurring in this layer, compared with those of the inner portions of the pile and the low cost of whitewashing, indicated that whitewashing of storage piles may be profitable.

Spring wheat production in Colorado, D. W. ROBERTSON, D. KOONCE, and J. F. BRANDON. (Coop. U. S. D. A.). (*Colorado Sta. Bul.* 487 (1944), pp. 16+, illus. 2).—Seedbed preparation, planting methods and varieties are recommended for growing spring wheat under irrigation and on dry land, on the basis of continued experiments (F. S. R., 70, p. 330). Thatcher is recommended for conditions similar to those at the station, 5,000-ft. altitude or lower; Thatcher, Marquis, and Dicklow for conditions like those at Fort Lewis, about 7,500-ft. altitude; and Reward and Thatcher for dry land, as at Akron.

Spring wheat at East Lansing, Michigan, H. M. BROWN (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 320-321).—Planting dates and rates, seed treatment, and fertilizers are suggested for spring wheat in the Lower Peninsula. The so-called running out of spring wheat is attributed mainly to failure to plant early enough, injury by hessian fly, damage by stem rust, leaf rust, or scab, and failure to maintain purity and to plant clean plump seed. Many varieties outstanding elsewhere have proved unsatisfactory in East Lansing tests.

Regent wheat for the Upper Peninsula, J. G. WELLS, JR., D. L. CLANAHAN, and B. R. CHURCHILL (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 298-300).—Upper Peninsula conditions require that a wheat variety should be highly resistant to stem and leaf rust, early maturing, stiff strawed, satisfactory for market as well as feed, and able to compete with barley in yield. Regent wheat has met the requirements to a greater degree than any other wheat tested and has demonstrated that it has a definite place on farms in the region and may in time largely replace the growing of barley as livestock feed. Suggestions for growing Regent wheat are based on experiments 1942-44 and experience.

Prairie: A new soft winter wheat for Illinois, O. T. BONNLT, C. M. WOODWORTH, G. H. DUNGAN, and B. KOEHLER (*Illinois Sta. Bul.* 513 (1945), pp. 593-600, illus. 2).—Prairie, a winter-hardy, stiff-strawed, and high-yielding soft red winter wheat, with excellent milling and baking qualities, is bearded and has glabrous brown chaff, has soft and short to mid-long kernels, is resistant to wheat mosaic and to the physiologic races of black stem rust common in Illinois. It originated as a single-plant selection from a field of Illinois 2 grown on soil infested with the virus of wheat mosaic. Its objectionable characteristics are susceptibility to loose smut and leaf rust. Because of its stiff straw, Prairie may be grown on fertile soil, where it is best adapted, but for commercial reasons plantings should be limited to sections of Illinois where soft wheat predominates. Its behavior in variety (F. S. R., 93, p. 38) and milling and baking tests in comparison with other wheats is reported.

A brief history of wheat variety changes on farms in North Dakota, T. E. STOA (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 6, pp. 21-26).—Varieties of spring wheat are discussed in the order of their introduction into North Dakota, beginning in early years with Red Fife, this supplemented with Bluestem and both largely replaced later by Marquis and a considerable acreage of durum wheat. Marquis in time was replaced by Ceres, especially in eastern and central North Dakota, and an expanding acreage of durum, especially in the rust area in the eastern section. Reward came into considerable production in northeastern North Dakota. Thatcher followed later, replacing Ceres and Reward in eastern and central North Dakota and to a considerable extent elsewhere, as well as taking over much of the remaining Marquis acreage. Renown, Regent, Rival, Pilot, and Vesta then followed, taking over a considerable proportion of the Thatcher acreage. In 1944 the North Dakota wheat acreage sown, according to a survey by the U. S. Department of Agriculture, was about 82 percent hard red spring and 18 durum. Estimated percentages of hard red spring acreage sown to leading varieties were Thatcher 32; Rival 31; Regent 12; Pilot 8; Renown 6; and Vesta 4. More

than 90 percent of the record 1944 wheat crop of the State was produced by varieties coming into farm production within the last 10 yr.

Registration of improved wheat varieties, XVII, J. A. CLARK. (U. S. D. A.) (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 4, pp. 314-318).—Varieties approved for registration (E. S. R., 91, p. 542) with performance records include Sanford, a soft red winter wheat (E. S. R., 84, p. 431); Wichita, an early hard red winter variety; Mida, hard red spring wheat (E. S. R., 92, p. 787); and Orfed, a white wheat (E. S. R., 93, p. 282).

Composition and vitality of quack grass roots, A. J. PINCKNEY (*North Dakota Sta. Bul.* 334 (1945), pp. 16, illus. 2).—Compared with roots from quackgrass allowed to grow normally, roots from hoed plats contained much less total sugars but more starch and very much more crude fiber on November 11. While hoeing diminished root reserves and plant vigor to a fatal level, clipping in one season lowered them very slightly, and because of new leafy growth near the ground, even weekly mowing did not seriously or permanently reduce them. These observations were confirmed by transplanting experiments in which weighed samples of roots were transplanted, redug at intervals, and analyzed.

Toxicity of certain herbicides in soils, A. S. CRAFTS (*Hilgardia* [California Sta.], 16 (1945), No. 10, pp. 459-483, illus. 16).—Ammonium thiocyanate, when first applied to soils, was found to be extremely toxic but not retained in an available form by the soil. Toxicity is related inversely to soil fertility and is rapidly reduced with cropping. Yields on soils sterile during the first cropping may surpass yields of untreated checks by the second or third cropping. Indications were that ammonium thiocyanate should be used on annual and shallow-rooted perennial weeds in cropped or pasture areas and should be applied to come into immediate contact with the foliage or roots to be killed. Sodium thiocyanate, somewhat less toxic than the ammonium salt, has not proved particularly effective in the field. The toxicity of both is reduced rapidly during cropping; and yields increase, presumably because of oxidation to nitrate and sulfate.

Ammonium sulfamate is lower in initial toxicity than ammonium thiocyanate, but the change in toxicity is less marked during cropping. Toxicity is inversely related to fertility. Yields in the second and later crops showed marked stimulation above untreated checks.

Sodium dinitro-*o*-cresylate is toxic in soils at about the same concentration as ammonium sulfamate, and the change in toxicity with cropping is of like magnitude. Toxicity is more definitely related to textural grade than to fertility; and this chemical is retained in an available form, particularly in soils of high colloid content. Retention is less than with arsenic but more than with borax. Initial applications in the range of 5 to 40 p.p.m. greatly stimulated crop yields. No hazard appeared to exist from accumulation of dinitro-*o*-cresol or its salts in the soil after their use as selective or general contact herbicides.

Ammonium borate and sodium pentaborate resemble borax in their toxicity relations in soils. Ammonium persulfate was not toxic enough to be used in weed control. See also earlier contributions (E. S. R., 85, p. 618).

Studies on the activation of herbicides, A. S. CRAFTS and H. G. REIBER (*Hilgardia* [California Sta.], 16 (1945), No. 10, pp. 485-500, illus. 4).—Activation of substituted phenol herbicides has become an established practice. In an unactivated Sinox (E. S. R., 83, p. 55) solution when the dinitro-*o*-cresol formed by hydrolysis of the cresylate-ion is selectively absorbed by the plant, the remaining solution tends to become alkaline, and this represses association and inhibits absorption. In the activated solution containing an acid salt or an ammonium salt, the hydroxide-ion produced combines with the acid or ammonium ion allowing further production of the cresol, and absorption is favored. Buffering may also be

accomplished by adding a strong acid; when the pH goes below 5.2 a white precipitate of dinitro-*o*-cresol is formed. As long as the solution remains saturated, activation is maintained. No evidence of activation of sodium arsenite by sodium pentachlorophenate could be found. The evidence on activation of chlorate is less clear. Activation of substituted phenol herbicides can be accomplished by any acid or acid salt that produces undissociated phenol molecules in the solution. The same result may be had by using the ammonium salts. Where very alkaline water is used, the buffer capacity of the ammonium ion may be exceeded.

Chemicals to kill weeds and diseases in tobacco beds, E. E. CLAYTON. (Coop. Ga. Coastal Plain, S. C., N. C., Tenn., and Md. Expt. Stas. et al.). (*U. S. Dept. Agr.*, 1945, *11S-31*, pp. [4], illus. 6)—Methods and quantities of calcium cyanamide and urea to use in controlling weeds and disease in tobacco plant beds are recommended from cooperative studies.

HORTICULTURE

Trials of vegetable crop seed production are conducted in new districts in Colorado, A. M. BINKLEY (*Colo. Farm Bul. [Colorado Sta.]*, 6 (1944), No. 6, pp. 2-5, illus. 2)—In cooperation with the U. S. D. A. Cheyenne Horticultural Field Station, roots of carrots and beets were grown at various locations in Colorado to determine possibilities in seed production. Results at Akron were sufficiently promising to suggest commercial possibilities. At the Arkansas Valley Substation the winter of 1943-44 was sufficiently mild to overwinter beets and carrots in the field, with a good crop of seed in 1944. Good survival of carrots was obtained also at the Fort Lewis Substation. At the Orchard Substation all beets were killed during the winter of 1943-44. Greeley, Grand Junction, Olathe, Delta, and Cortez areas are apparently satisfactory seed-producing areas particularly for carrots, and commercial acreages of carrot seed were grown in 1944 in the Olathe, Delta, Grand Junction, and northern Colorado districts. Considerable expansion of onion seed production has occurred, particularly in the Western Slope district. Mountain Danvers is the principal variety grown for seed. Good quality bean seed was produced in the San Juan Basin. Attempts to overwinter cabbage in the field near Fort Collins was not highly successful due to heavy winter mortality. More success was noted in the Western Slope area with late planted cabbage.

Some new ideas in weed control, B. H. GRIGSBY and K. C. BARRONS (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 301-309, illus. 1).—Various chemicals were applied to young onions growing on a muck soil known to be infested with weed seed. The yield of onion from the sulfuric acid-treated plots was much greater than from the controls or from any other treatment. It is deemed possible that in addition to killing weeds, the acid may have exerted a favorable effect through modification of the soil reaction. Information is presented on methods of handling and applying the acid spray.

Carrots and parsnips were sprayed with kerosene, gasoline, fuel oil, and certain other materials. The fuel oil proved extremely toxic to both vegetables. The kerosene did not injure the vegetables, but was not effective as a weed killer. Gasoline gave good weed control, but is too hazardous from the standpoint of fire.

In preliminary tests in weed control in canning pea fields, certain proprietary materials showed some promise.

Control of weeds by pre-emergence treatments, such as burning, was found feasible in the case of onions and seedling asparagus. When combined with a subsequent dilute sulfuric acid treatment for later weeds, the pre-emergence burning appeared to have considerable promise.

Strain of Giant Pascal celery resistant to "yellows" is being developed at station, A. M. BINKLEY and W. A. KREUTZER (*Colo. Farm Bul. [Colorado Sta.]*, 7

(1945), No. 3, pp. 3-4, illus. 1).—Certain of the seedlings obtained from a cross made in 1941 between two types of Giant Pascal celery, both of which had been grown in Colorado for many years, were found to be highly resistant to *Fusarium apii*, an organism that lives and accumulates in the soil. In addition the new selections appear tolerant or partially resistant to late blight, *Septoria apii*.

Production of onion seed from wintered-over "scallions", P. BOWSER, F. N. HEWETSON, and K. C. BARRONS. (Mich. Expt. Sta.). (*Seed World*, 56 (1944), No. 2, pp. 12-13, illus. 2; abs. in *Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, p. 374).—In studies of onion seed production in northern Michigan, it was apparent that late-sown immature onions overwintered in the field more successfully than did mature onions. Very pronounced varietal differences with respect to winter survival were noted. White Portugal and Southport Red Globe gave best survival in 1943-44. Ebenezer, Australian Brown, Southport White Globe, and various strains of Yellow Globe may be classified as hardy. Utah Sweet Spanish, Early Grano, Yellow Bermuda, and Ailsa Craig lacked in hardiness. Snow cover was an important factor in successful wintering and the area bordering Lake Michigan from Oceana County northward appeared to combine good snow cover, moderate winter temperature, and a reasonably early maturity to a satisfactory degree. Mildew is the greatest disease hazard and good air drainage is probably of value in minimizing losses. Certain insect problems are also discussed.

Influence of honey bee habits of radish seed yield, J. C. KREMER (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 4, pp. 413-420, illus. 4).—Observations on the radish bloom indicated that it is short-lived, anthesis occurring usually during the early morning hours, with the corollas remaining fresh throughout the day and possibly into the second day if temperatures are moderate. The blossoms are attractive to insects. The results of the study suggested the planting of radish seed fields at some distance away from competitive honey crops, such as sweet clover, the location of radish seed fields within easy flight distance from permanent bee yards, and in the absence of adequate bee colonies the renting of hives of bees for use during the radish bloom.

A study of the causes of low germination of radish seed crops, K. C. BARRONS and D. M. MCLEAN (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 4, pp. 398-408).—Of various causes of low germination of radish seed, too high a moisture content in the seed in the sack after threshing was indicated as the most potent cause. If the seed is dried thoroughly directly after threshing and then cleaned to remove sprouted seeds as far as possible, seed cured during wet weather is not necessarily of substandard vitality. In experiments on the relative rate of germination loss of seeds held at different moisture levels, germination declined rapidly at the higher levels even where no heating occurred and little if any mold developed. Seed-borne organisms did not appear to be an important cause of low germination nor did the experiments suggest the control of seed-borne fungi as a means of insuring higher germination percentages in low-germinating seed.

Cover crops for fruit plantations.—I, Short term leys, W. S. ROGERS and T. RAPTOPOULOS (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 120-139, illus. 7).—The effects of five cover crops, ryegrass, red clover, clover and ryegrass, alfalfa, and natural weeds mostly *Poa*, grown for 2 yr. and then plowed down, were compared with clean cultivation in an apple orchard so divided that each plot contained the same number and variety of trees. The alfalfa, clover, and ryegrass plus clover produced very large amounts of green material. During growth of covers there was some check to tree growth, but when plowed under they had a stimulating effect. However the cover-cropped trees had not caught up with the clean-cultivated trees 2 yr. after plowing of cover crops. The check by cover crops is believed due to competition for both nutrients and water. The total weight of

fruit over the 4 yr. was slightly larger on the cover-cropped areas. While the cover crops were growing, fruit color was improved materially. Trees in grass alone were the only ones to show marked nitrogen deficiency.

Film formation and structure of some oil emulsions, I. M. FELBER. (Mich. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 6, pp. 231-254, illus. 11).—Microscopic studies of the films of oil emulsions deposited on polished glass slides and other prepared surfaces showed them to possess visible structure which may be useful in determining capacity for adherence and coverage and also their stability. Two types of materials were used (1) dispersions of vegetable oils in water, with the presence of ammonium salts of fatty acids, proteins, and bentonite, to form the system of emulsification and to give added stability, and (2) proprietary oil emulsions consisting of more or less refined petroleum oils, dispersed in water, and offered to the trade as insecticides.

Thinly spread layers of the emulsions of both groups, when deposited on receptive surfaces, dry and form adherent, solid, and more or less continuous films. Observations on the vegetable oil emulsions at successive stages in the drying process showed the progressive development of a fixed "honeycomb" structure, effected by aggregates of the original particles. The final distribution of phases in this honeycomb structure varied with the proportional composition of the emulsion on a given type of surface. In general, films of the proprietary emulsions when deposited on glass surfaces showed far less tendency toward definite configurations.

Studies on types of surfaces other than glass indicated that the substratum exerts considerable influence on the formation and pattern of films. A special case was that of paraffin which, upon drying, developed a surface pattern and contour that resulted in the localization of the spray in depressions, leaving the elevated ridges without covering.

Emulsions for horticultural sprays, E. J. MILLER, A. L. NEAL, and V. R. GARDNER (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 338-351).—Discussing the background and basic needs that prompted the investigations, the authors describe a wax emulsion consisting essentially of microscopic particles of paraffin suspended in water carrying a colloidal clay and also an emulsifier to keep the wax particles in suspension. The material now being manufactured commercially has proved highly successful as a protective coating for freshly transplanted evergreens and fruit trees to retard excessive transpiration and wilting. Because under certain conditions foliage was injured by the emulsion, further improvements were made to remove the harmful properties. A new emulsion designated as T.S.S. was promising, but could not be satisfactorily diluted with hard water. Still another emulsion was developed which could be used with hard water and was not affected by any of numerous fungicides and insecticides. In 1944 the latest material was used on a large number of horticultural plants with the appropriate fungicides and insecticides and in many cases gave gratifying results. On apple leaves more of the useful spray material was retained over a considerable period when used with the new emulsion.

The T.S.S. material was also tested as a blossom thinning spray for fruit trees. In the case of Duchess trees, sprayed during full bloom, there were more single apples and less clusters of two, three, and four fruits per spur than on the control trees. Some of the necessary precautions in the use of emulsion sprays are discussed.

The intensive culture of hardy fruit trees—I, Trials of Cox's Orange Pippin and Worcester Pearmain apple cordons, A. B. BEAKBANE (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 41-52, illus. 5).—A description is given of root-stock, spacing, pruning, and training experiments.

Growth and yield of McIntosh apple trees as influenced by the use of various intermediate stem pieces, F. N. HEWETSON. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 181-186).—Following an earlier report (E. S. R., 88, p. 480) on comparable experiments with Steele Red apple, the author discusses the results of investigations with different interstocks in the propagation of the McIntosh apple. Tree size was significantly decreased by the use of Malling IX as the interstock. Yields were significantly increased by the use of Haas and similarly reduced by the use of Dudley interstocks. Malling IX interstocks were observed to hasten maturity and increase the color of fruit. The use of a scion/interstock ratio to express the type of graft unions is discussed briefly.

Studies in the diagnosis of mineral deficiency, II, III, D. W. GOODALL (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 90-102, 103-107).—Continuing the general investigation (E. S. R., 90, p. 627), two papers are presented.

II. *A comparison of the mineral content of scorched and healthy leaves from the same apple tree.*—On three occasions during 1942, samples of scorched and apparently healthy leaves were collected from the group of 24 apple trees. In 1943, samples were collected once from 12 of the trees. In 11 of the 12 pairs of trees, the scorch symptoms could be related to a low concentration of either Mg or K in the foliage. The concentration of mineral elements in slightly scorched leaves did not differ significantly from that in healthy leaves, with the exception of Mg which was consistently lower in the scorched leaves of trees deficient in Mg. In severely scorched leaves, the manganese content was also lower than that found in healthy leaves on the same tree. The only significant seasonal changes in mineral concentration were in Ca, which increased between July and October, and in Mg which decreased in trees suffering from Mg deficiency but increased in others. The concentration of the several elements in the various portions of a leaf is discussed.

III. *The mineral composition of different types of leaf on apple trees in early summer.*—Leaf samples were collected just before blossoming time from Cox Orange apple trees on Malling IX and XII rootstocks and receiving different amounts of sulfate of potash and sulfate of ammonia. The basal, middle, and apical leaves of flowering spurs and basal leaves of nonflowering were analyzed separately. Leaves of trees on Malling XII, a vigorous rootstock, contained less Ca, more Mg, and possibly more K than trees on Malling IX, a dwarfing stock. There was more Fe and K in leaves from flowering than from nonflowering shoots. In trees receiving sulfate of ammonia, Fe was most abundant in the apical leaves of flowering spurs. In trees receiving no sulfate of ammonia Fe was most abundant in the basal leaves. The data indicate the importance of using the same type of leaf when comparing trees.

The relationship between respiration and physical condition of fruit as affected by oil treatments, J. REYNEKE and H. L. PEARSE (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 8-27, illus. 10).—Studies with Bartlett (Bon Chrétien) pears and Golden Delicious apples showed a close relationship between the rate of respiration, juice content, physical condition of the fruit, and storage life. Oil applied evenly as a thin film over the surface of the fruit during the preclimacteric phase reduced the rate of respiration and increased juice content as compared with untreated fruits. Oil applied after the preclimacteric phase maintained a low respiration rate and a high level of juice. The effect of the oil is believed to lie in controlling the rate of gas exchange between the internal and external atmospheres. Peanut, olive, butter, mineral, soybean, and corn oils were effective in descending order, more or less in order of chemical saturation. A reduced rate of respiration was accompanied by a reduced rate of acetaldehyde production, reduced acid consumption, and a delayed onset of scald development. The development of scald is ascribed to senescent breakdown which precedes acetaldehyde formation, the latter being a

secondary factor which may accentuate or accelerate the development of this disorder.

In pears held at 86° F. under conditions of restricted ventilation in which the carbon dioxide given off by the fruit was allowed to accumulate, the rate of respiration was reduced so that only a small climacteric rise occurred. These pears became extremely juicy, highly palatable, and developed a full yellow color.

Indolylacetic acid added in low concentrations to oil appeared to increase rate of respiration slightly. High concentrations reduced respiration rate significantly. Pears from trees sprayed with oil showed reduced respiratory activity and broke down and scalded less rapidly than fruit from arsenate of lead or unsprayed trees. Wetting agents, or wetting agents together with hydrochloric acid for removing spray residues, increased the rate of respiration and shortened the storage life of pears considerably.

The use of dinitrocresol-mineral oil sprays for the control of prolonged rest in apple orchards, R. M. SAMISCH (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 164-179, about 6 illus.).—Failure to resume normal growth in spring was observed in deciduous fruit orchards in Palestine and led to experiments in which apple trees were sprayed with dinitrocresol-mineral oil emulsions in an effort to break the rest period and encourage normal development. Early treatment had a forcing effect, stimulating earlier foliation, bloom, and maturation of the fruit. Later sprays on the other hand had certain advantages, tending to concentrate the blooming period and to decrease the number of buds which fail to develop. As a result yields were larger and the crop matured more uniformly in the later sprayed than in the earlier sprayed trees.

Pollen tube growth and embryo-sac development in apples and pears, I. MODLIBOWSKA (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 57-89, illus. 22).—Incompatibility in apple and pear pollinations is due to physiological reactions occurring between the pollen tube and the stylar and ovarian tissues. In some cases, the pollen tube is inhibited in the style, in others inhibition may occur after the tube reaches the ovary. The reactions are of genetic origin, the essential feature being apparently that pollen tubes cannot function properly in stylar or ovarian tissue containing the same incompatibility genes as the pollen. A general similarity was observed in the behavior of pollen tubes in the apple and pear. In both fruits there was an accelerating influence of high temperature on the growth of compatible tubes and an inhibitory effect on incompatible tubes. The main difference between pears and apples was that only one type of incompatible pollen tubes was observed in the selfed diploid pears, while in some apples bimodality was very pronounced. Bimodality was also observed in pollen tubes when triploid varieties of apple or pear were selfed. In cross pollination most pollinations between diploid varieties were compatible, with some exceptions in both fruits.

Thinning apples with the sodium salt of naphthyl acetic acid, J. H. DAVIDSON, O. H. HAMMER, C. A. REIMER, and W. C. DUTTON (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 352-356).—A sodium salt of naphthylacetic acid designated as NaNAA produced marked results in the thinning of the fruit of several varieties of apple when used alone, with wettable sulfur, with wettable sulfur and hydrated lime, and with lead arsenate present. The greatest thinning, sometimes too severe, occurred when the material was applied at full bloom. Applications made just before or just after bloom were less effective than at full bloom but often adequate. Treatments made at 2 and 3 weeks after petal fall were less effective than at petal fall, and applications 4 weeks after petal fall had no apparent effect. Varieties responded differently and the same variety did not behave the same every year. Foliage injury was not a problem in any case.

An experiment in the placement of orchard fertilizers, T. A. MERRILL and G. SPRINGER (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 357-359, illus. 2).—The importance of proper placement of fertilizers for trees growing in sod was demonstrated in the case of two Montmorency cherry trees. Using the same amount and same kind of fertilizer, the tree in which the fertilizer was applied in a band under the outer branches made much better growth and was more productive than where the fertilizer spread mostly on the area between the trees. Presumptively in the latter case the grass absorbed most of the nitrogen.

Utilization of ammonia supplied to peaches and prunes at different seasons, H. I. FORDE and E. L. PROEBSTING (*Hilgardia* [California Sta.], 16 (1945), No. 9, pp. 411-425, illus. 2).—Plots of peaches and prunes were fertilized with $(\text{NH}_4)_2\text{SO}_4$ in January and with NH_3 in the first irrigation, the last irrigation, and half in the first, the other half in the last irrigation. Each tree received 1 lb. of N per tree per year for 5 year. Peaches gave increased yields irrespective of time of application, with an indication that fall was a slightly less favorable season than winter or spring and that no advantage inheres in a split application. Prunes in the same soil type and district failed after 5 yr. to produce increased yields. Nitrogen applied as NH_3 in the irrigation water behaved essentially the same as $(\text{NH}_4)_2\text{SO}_4$. Nitrogen levels in the plant parts analyzed reflected the treatments, and after an application they remained higher than the check until the next application. That is, at the rate used and for the conditions of the experiment, the time of applying N was a matter of minor importance. Soil analyses showed fixation of NH_4^+ in the surface soil with no evidence of plant absorption before leaching of nitrates into the root zone. Maximum concentration of permanent roots was between 1 and 3 ft. No effect of treatment on size, maturity, or quality of fruit was noted.

Peach variety tests: State College, 1945, W. S. ANDERSON (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 8, pp. 1, 7).—These trials included a number of the more recent introduction from State and Federal experiment stations as well as older commercial varieties for comparison. Alton and Mikado were the first to mature, yielding a part of their crop on May 29, 1945. The latest picking, Kalhaven, was made on July 17. The height of the season was during the last 10 days of June.

Some observations on the ripening of plums by ethylene, W. H. SMITH (*Jour. Pomol. and Hort. Sci.*, 21 (1945) No. 1-4, pp. 53-56).—Plums harvested in different stages of maturity were treated with different concentrations of ethylene ranging from 1 part in 250 to 1 part in 156,000 parts of air. The principal effect of the ethylene was to accelerate change of color, softening, and the development of the typical ripe plum odor. No appreciable effect upon the changes in sugar and acid contents during ripening were observed. Abnormal color changes were induced by concentration of 1:250 and 1:31,000 of ethylene to air.

Key for the identification of the commonly cultivated commercial varieties of strawberries, J. FLOOR and W. S. ROGERS (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 34-40, illus. 14).—This key covers 10 varieties, including all that are commercially important in England at the present time.

Cooling LCL shipments of raspberries with dry ice, J. D. WINTER. (Minn. Expt. Sta.). (*Ice and Refrig.*, 109 (1945), No. 3, pp. 26-27, illus. 2).—Covering crates of red raspberries with a specially designed blanket under which was placed a quantity of dry ice showed promise as a method of protecting berries during transportation to market. Under the conditions of the tests it was found that approximately 75 lb. of dry ice could be used without freezing the berries in the underlying crates. The maximum concentration of carbon dioxide found under the blanket was 13 percent, a concentration which did not affect adversely the flavor of the fruit and may, in fact, be helpful in retarding the development of mold and in maintaining good fruit color.

Grapes and wines from home vineyards, U. P. HEDRICK (*New York and London: Oxford Univ. Press., 1945, pp. 326+*, about 60 illus.).—Prepared by a former member of the staff of the New York State Experiment Station, this book presents valuable information on the origin and development of grape growing in North America, with particular attention to varieties, cultural requirements, and the use of grapes both as fresh fruit and in the manufacture of wine.

Promising grape varieties, R. WELLINGTON. (N. Y. State Expt. Sta.). (*Amer. Fruit Grower*, 65 (1945), No. 9, pp. 10-11, 30-31, illus. 7).—Information is presented on the grape breeding activities of the New York State Experiment Station, which over the years has fruited some 30,000 grape seedlings at Geneva and Fredonia. Of this number, about 30 have been considered of sufficient merit to receive a name. Brief comments are presented on these named varieties, pointing out their important characteristics, value, usefulness, etc.

Ephraim Bull and the Concord grape, W. J. BURTSCHER (*Amer. Fruit Grower*, 65 (1945), No. 9, pp. 12, 24, 26, 28-29, 35, illus. 1).—Included in this general article is information on the origin and distribution of the Concord grape.

Keeping vines vigorous, I. W. WANDER. (Ohio Expt. Sta.). (*Amer. Fruit Grower*, 65 (1945), No. 9, pp. 13, 32-33, 35, several illus.).—Among the reasons underlying the decline of grape production in certain areas of Ohio are old age of vines, replanting on soil that had been previously in grapes, and soil loss due to the almost continuous tillage of slopes. Studies of the chemical and physical changes of vineyard soils showed in some cases that organic matter losses reached as high as 80 percent of what was originally present. Similar losses were observed in total nitrogen. Accompanying such losses there was a great increase in erosion and a loss in permeability to water. Restorative measures include more careful selection of sites, periodic elimination of old vineyards, less intensive cultivation, contour planting, use of stable manure and fertilizer, and the growing of cover crops to maintain organic matter.

Citrus in Latin America, H. MANESS (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 8, pp. 147-150, illus. 4).—Information is presented on the distribution of citrus trees in Central and South America, varieties, size of plantings, utilization as food and as source of orange oil, production, diseases—especially *tristeza* root rot—and prospects for the future.

The influence of nitrogen nutrition of the tree upon the ascorbic acid content and other chemical and physical characteristics of grapefruit, W. W. JONES, C. W. VAN HORN, and A. H. FINCH (*Arizona Sta. Tech. Bul.* 106 (1945), pp. 455-484, illus. 20).—Three levels of nitrogen nutrition were maintained in plots established in a 15-year-old Marsh grapefruit orchard located on the Yuma Mesa Experimental Farm. On the high N plot, the soil was kept free of weeds and N fertilizer was applied at frequent intervals throughout the year. On one of the other two plots, N was maintained at a high level at blossoming time, descending to a moderate level as the fruits matured. On the third plot, N was at a high level at blooming time, descending to a very low level through the period of fruit growth and maturity.

Fruit which matured under continuing high N level had, as compared with that ripened under a declining N level, (1) a higher N content of juice and peel, (2) lower Brix and higher acid of juice, (3) higher pH of juice, (4) lower ascorbic acid, (5) later coloration, (6) some regreening, (7) larger size, (8) greater weight, (9) relatively low weight: volume ratio, and (10) relatively thick, coarse-textured peel.

The percentage of juice was not affected by the N nutrition, but the larger fruits from the continuous high N area contained more juice per fruit. Nitrogen applied to the soil after the fruit matured did not increase the N content in the fruit although it did enter the leaves. Phosphorus, calcium, and potassium contents of

leaves and fruits was much alike in all plots, apparently because of the fact that at the time spring growth and blossoming occurred, N nutrition was uniformly high in all plots.

Peel of Valencia orange and Marsh grapefruit as affected by the rootstock variety, A. R. C. HAAS. (Calif. Citrus Expt. Sta.). (*Calif. Citrus*, 30 (1945), No. 11, pp. 341, 368-369).—Observations on fruits harvested from experimental orchards of Valencia orange and March grapefruit established at Riverside, Calif., to test the value of various rootstocks showed that the rootstocks had considerable influence on the percentage of peel as compared to flesh and juice. The average peel of Valencia oranges grown on the various rootstocks was 28.78 percent of the fresh weight of the fruits, with a difference of nearly 9 percent between the highest and the lowest. Notable differences were observed also in the peel percentage of the Marsh grapefruit, ranging from 49.16 percent on rough lemon to 34.58 percent on trifoliate orange roots. The peel of Marsh grapefruit from trees on trifoliate orange and grapefruit rootstocks was generally high in the percentage of dry matter and low in moisture percentage.

Date culture in the United States, R. W. NIXON (U. S. Dept. Agr. Cir. 728 (1945), pp. 44, illus. 17).—An outline of cultural practices in date growing as developed through experience and research in the desert areas of California and Arizona. Particular attention is given to propagation, soil management, pruning, pollination, storage of pollen, selection of male palms, fruit thinning, bunch management, harvesting and handling of fruit, and diseases and pests, with brief notes on the varieties grown on a commercial scale and 59 literature citations.

Propagating derris by cuttings, D. G. WHITE (U. S. Dept. Agr., Agr. in Americas, 5 (1945), No. 8, pp. 154-156, illus. 3).—Over 2 million cuttings and plants of *Derris elliptica* have been distributed throughout the tropical Americas during the past 3 yr. by the Federal Experiment Station at Mayaguez, P. R. This paper discusses methods of selecting, handling, and planting cuttings, and of transplanting the rooted cuttings to the field.

Mineral deficiencies in *Derris elliptica*, R. H. MOORE (Puerto Rico Fed. Sta. Bul. 43 (1945), pp. 26+, illus. 6).—*D. elliptica*, a legume from the Southwest Pacific area, is an important source of the insecticide rotenone. This paper discusses the results of an experiment on the symptomology of certain nutrient deficiencies in *Derris* and the relationship of such deficiencies to the composition of the roots. Cuttings from a single clone were grown for 1 yr. in sand cultures lacking in S, N, P, Ca, K, Fe, and Mg, respectively. The checking of shoot growth, common to all mineral deficiencies, was most severe where K, P, or Ca was lacking. Specific patterns of chlorosis appeared in the leaves of all deficiencies except —N, —K, and —Ca. When the lacking materials were applied to young leaves the characteristic deficiency symptoms did not appear. Dry roots of greenhouse grown plants with complete nutrient supply were much lower in rotenone than comparable material grown out-of-doors. Root quality, expressed as the concentration of rotenone plus rotenoids, was highest in the —S and lowest in the —Mg roots. The number, distribution, and staining properties of rotenoid cells were correlated with root quality. Soluble organic N was directly correlated with root quality. The value of N in chemical fertilizers for *Derris* is questionable, but the application of K and P may increase both the quality and quantity of *Derris* roots.

Fertilizing young tung trees, S. R. GREER (Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 6, p. 8).—Investigations conducted on a cut-over Norfolk fine sandy loam that had not been cultivated previously and had been burned over annually for many years showed that nitrogen and phosphorus were by far the most essential elements for young tung trees. Phosphorus increased the production of fruit over nitrogen alone. In 1944 the addition of potassium in connection with phosphorus and nitrogen decreased yields. The average production of eight plots where phos-

phorus was applied was 1,000 lb of fruit per acre and of eight plots without phosphorus 525 lb. per acre. Calcium did not increase production materially unless applied with phosphorus. Considerable difference was observed in the response of different tung varieties to the various fertilizer treatments.

Camellias for the yard, W. D. KIMBROUGH and C. E. SMITH (*Louisiana Sta. Bul.* 391 (1945), pp. 12).—General information is presented on varieties, planting sites and planting operations, soil preferences, fertilizers, watering, mulching, propagation, protection from low temperature injury, control of insect and disease pests, etc.

Improvement in keeping quality of succulent plants and cut flowers by treatment under water in partial vacuum, C. L. HAMNER, R. F. CARLSON, H. B. TUKEY. (N. Y. State Expt. Sta.). (*Science*, 102 (1945), No. 2648, pp. 332-333).—A method, which consists of withdrawing the air from plant tissues by vacuum treatment and then permitting its replacement by water, prolonged the life of cut flowers by several hours. In the case of lilacs, branches which were placed in water directly after treatment kept fresh and in good condition for 5 days, whereas untreated branches held under comparable conditions showed wilting within 2 days. Treated flowers showed a water soaked appearance for a short period but this condition disappeared usually within a few hours.

Treated tissues gained markedly in weight, sometimes actually double that recorded prior to treatment. In general the better results were obtained with plant materials that have large leaves and stems and large inferior ovaries, capable of holding water.

A simple automatic window-opening device for temperature control in greenhouses, O. V. S. HEATH and E. J. WHITCHER (*Ann. Appl. Biol.*, 32 (1945), No. 2, pp. 173-176, illus. 3).—Construction and operation are discussed.

FORESTRY

Private forest land ownership and management in the loblolly-shortleaf type in southern Arkansas, northern Louisiana, and central Mississippi, H. H. CHAMBERLIN, L. A. SAMPLE, and R. W. HAYES (*Louisiana Sta. Bul.* 393 (1945), pp. 46, illus. 13).—Industrial owners, although representing less than 1 percent of the total number of owners in the areas under study, controlled about 35 percent of the total forest land and 79 percent of the pine forest land. Timber on industrially owned land is larger than that of nonindustrial owners. Over 98 percent of the industrial lands are under cooperative agreement for fire protection in the States where protection is available. Nonindustrial owners are not cooperating with organizations in fire protection. In Arkansas, Mississippi, and Louisiana the nonindustrial owners are producing pine at the rate of 31, 33, and 40 percent of their full capacity, respectively, as compared with 51, 32, and 53 percent for industrial owners. Most large industrial owners show a definite interest in forest conservation by enlarging their holdings and by applying cutting practices which maintain or increase the forest capital.

Current cutting practices on the nonindustrial lands are on the other hand depleting the forest capital. Type of cutting contracts, rather than the class of product removed, is largely responsible for present conditions. On nonindustrial lands, timber production is higher where the owner is interested in timber growing in connection with agriculture. Resident and adjacent owners comprise 87 percent of the number of nonindustrial owners and control 80 percent of the nonindustrial land.

Long-continued ownership tended toward a slightly higher productivity than did shorter ownership. No significant relationship was established between occupation of the various occupational groups or of residence of the owner and forest productivity.

The management of young volunteer hardwood stands, H. H. TRYON (*Black Rock Forest Bul.* 13 (1945), pp. 28+, illus. 5).—This paper describes the principal forest types occurring in the Hudson River highlands and sets forth suggestions for their most profitable management. The first species to appear on abandoned farm land are usually fast-growing, short-lived trees such as red maple, red cedar, gray birch, aspen, and cherry. In time, these species yield to more durable tree associations of considerably higher value. The climax associations are not necessarily the most valuable cover type. Release cuttings in young mixed hardwoods should be delayed until the crop species are at least 7 to 8 ft. high. Release cuttings should not be too severe, with two light cuttings more desirable than one heavy one. A working knowledge of the various forest types and their places in the local vegetational successions, as well as their silvicultural requirements is essential to a program of accelerated accessions.

Adjustment of black spruce root systems to increasing depth of peat, R. K. LEBARRON. (U. S. D. A.). (*Ecology*, 26 (1945), No. 3, pp. 309-311, illus. 2).—Successive strata of adventitious roots are sometimes formed above the normal root collars of black spruce trees growing in swamps in northern Minnesota. The initiation of adventitious roots is attributed to the raising of the peat surface by the accumulation of litter. The basic cause underlying the development of new roots is believed to be due to the better aeration near the surface.

The effect of overhead shade on the survival of loblolly pine seedlings, H. H. CHAPMAN (*Ecology*, 26 (1945), No. 3, pp. 274-282).—Overhead shade of low hardwoods is fatal to loblolly pine seedlings. The average period required after initial shading, before death occurs, is a little over 5 yr. Under high overhead shade, with partial, intermittent sunlight and in the absence of low competitive hardwoods, loblolly pine can survive in a suppressed state for 10 to 20 yr. The silvicultural treatments indicated for managing mixed stands in order to obtain loblolly pine rather than inferior hardwoods consists, first of clear cutting in areas large enough to permit the pine seedlings to obtain full sunlight, and second, the killing back, by winter burning, of hardwood sprouts at the time of cutting the mature timber followed by the exclusion of fire until the new seedling crop reaches fire-resistant dimensions in from 6 to 10 yr. Single tree selection as a system will tend progressively to bring about the substitution of inferior hardwoods for loblolly pine in the future stand.

The agricultural veneer container industry in southern Michigan, R. C. JOHNSON. (U. S. D. A. coop. Mich. State Col.). (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 328-337, illus. 1).—The production of veneer containers, although a relatively small industry in southern Michigan (E. S. R., 91, p. 549), offers an important outlet for certain species grown in the farm woodlot. There is a need for more small scattered mills to manufacture the veneer. More attention should be paid to selective cutting of the larger better grade trees for the veneer mill. The lower quality logs could be sold to sawmills. The installation of improved drying equipment to improve the quality of the veneer would be desirable. Some of the highest quality veneers could be sold to furniture manufacturers at a better price to the woodlot owner. An improvement in veneer production would be a distinct aid to farm forestry through the better markets provided.

DISEASES OF PLANTS

Plant pathology: Teaching and research, W. BROWN (*Ann. Appl. Biol.*, 32 (1945), No. 2, pp. 89-96, illus. 1; *abs. in Nature* [London], 155 (1945), No. 3948, pp. 773-776).—This is the presidential address presented before the Association of Applied Biologists on February 23, 1945.

Differentiation of certain crucifer viruses by the use of temperature and host immunity reactions, G. S. POUND and J. C. WALKER. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 71 (1945), No. 6, pp. 255-278, illus. 10*).—The authors studied four viruses from cabbage and cauliflower at 16°, 20°, 24°, and 28° C. in various hosts. The symptoms of cabbage virus A and cabbage black ring virus increased in cabbage at 16°–28° except for necrosis with the black ring virus. The characteristic symptom from both was a coarse chlorotic mottle accompanied by leaf malformation. The symptoms from virus A were more severe than those from black ring virus at 24° and 28°; at 16° and 20° the reverse was true. At high temperatures symptoms induced by the two viruses on Brussels sprouts, *Nicotiana rustica*, and *N. multivalvis* were practically indistinguishable; at low temperatures the reactions differed markedly. Virus A caused conspicuous necrotic lesions on inoculated leaves of Chinese scarlet eggplant (*Solanum integrifolium*) and the necrotic symptoms became systemic; the black ring virus caused no symptoms on this host, and the virus was not recovered from inoculated plants. By use of the differential reaction between the two viruses on the hosts and at the above temperatures it was shown that virus A effectively immunizes cabbage against infection by the black ring virus and vice versa. These viruses are classed as strains of the turnip virus 1 of Hoggan and Johnson (E. S. R., 73, p. 624).

In cabbage infected with cabbage virus B and cauliflower mosaic virus, respectively, the symptom intensity increased with lowering of temperature, and complete masking occurred at 24° and 28°. The characteristic symptoms were chlorotic vein clearing and vein banding. At both high and low temperatures the reaction of the cauliflower mosaic virus was much more severe than that of virus B on such hosts as *Brassica pekinensis*, *B. nigra*, *B. napus*, *B. arvensis*, and *B. campestris*. By use of the differential reaction on *B. pekinensis*, virus B was shown to immunize cabbage against infection by the cauliflower mosaic virus. Virus B is classed as a strain of cauliflower virus 1. When either virus A or the black ring virus occurred in cabbage together with either virus B or the cauliflower mosaic virus, the resulting disease reaction was more severe than that induced by either virus alone. The increased severity of symptoms was so pronounced at 24° and 28° that they appeared as those of an entirely different disease. At low temperatures the activity of virus A or the black ring virus was so reduced that combination symptoms agreed very closely with those of virus B or of the cauliflower mosaic virus.

Observations on *Sclerotinia sclerotiorum* in Palestine, Z. ELAZARI-VOLCANI (*Palestine Jour. Bot., 4 (1944), No. 2, R Ser., pp. 206-207*).—A note on the occurrence and hosts.

Studies of *Pythium aphanidermatum* (Edson) Fitz. in China, T. F. YU, W. F. CHIU, N. T. CHENG, and T. T. WU (*Lingnan Sci. Jour., 21 (1945), No. 1-4, pp. 45-62, illus. 7*).—This fungus is widely distributed and attacks a large number of crops in China, causing damping-off, decay of vegetative organs, and rots of fruits and vegetables under field, storage, and market conditions. It has been isolated from infections in *Bemisia hispida*, *Citrullus vulgaris*, *Cucumis melo*, *C. sativus*, *Cucurbita maxima*, *C. pepo*, *Lagenaria leucantha*, *Luffa acutangula*, *L. cylindrica*, *Momordica charantia*, *Gossypium hirsutum*, *G. indicum*, *Capiscum annuum*, *Nicotiana tabacum*, *Solanum melongena*, *Ipomaea batatas*, *Phaseolus vulgaris*, *Beta vulgaris*, *Brassica pekinensis*, *Pachyrhizus tuberosus*, *I. reptans*, *Amaranthus tricolor*, and *Aletris fordii*. Cross inoculations of various hosts with different isolates failed to show differences in pathogenicity. A relative humidity of 90 percent or above favored the development of infection; at 85 percent or below, the disease was greatly checked. The optimum air temperature for development of the disease was 30°–35° C. The fungus grew well in most of the media commonly used; the cardinal temperatures were 41° or higher, 29°–31°, and 5°–10°; the optimum pH

for growth was about 6.1, and no growth was found at pH 2.5 or 10.7. The optimum temperature for germination of the sporangia was 24°–26°. The fungus was found in various kinds of soils and as deep as at least 8 in. below the surface; its distribution there is controlled by the moisture content, high soil moisture favoring growth. Infections of crops are said to be exclusively of soil origin; the fungus was found to live at least 4 yr. in the soil.

O vetor da "clorose infecciosa" das malváceas [The vector of infectious chlorosis of the Malvaceae], A. ORLANDO and K. SILBERSCHMIDT (*Biológico*, 11 (1945), No. 5, pp. 138–139, illus. 1; *Eng. abs.*, p. 139).—In preliminary experiments the authors succeeded in transmitting this chlorosis to *Sida rhombifolia* via members of the Aleyrodidae (white flies).

Transplantation of plant tumors of genetic origin, P. R. WHITE (*Cancer Res.*, 4 (1944), No. 12, pp. 791–794, illus. 2).—Tissues isolated from stems of the hybrid *Nicotiana langsdorffii* × *N. glauca*—normally producing tumorous overgrowths spontaneously—were grafted into healthy plants of *N. glauca* after being maintained as in vitro cultures for 5 yr. Here they produced typical tumors, thus appearing to possess the property of propagating their tumorous nature—in this case of genetic origin—indefinitely. Possible implications of this finding are briefly discussed.

The dispersion of air-borne spores, P. H. GREGORY (*Brit. Mycol. Soc. Trans.*, 28 (1945), pt. 1–2, pp. 26–72, illus. 6).—The deposition of air plankton, such as passively air-borne pollen or fungus spores, decreases with the distance from a source. The factors controlling this scattering of air plankton are reviewed (89 references), and observed gradients of deposition are discussed with special reference to fungi causing plant diseases. Equations are presented for the deposition of spores at various distances from a point source, and their relevance is discussed. Observed gradients of air-borne plant infections originating from a point source are shown to be closely predictable from the theory. Fungi known or suspected of being splash-borne, on the contrary, showed gradients incompatible with the theory. Gradients from strip sources could not at present be dealt with satisfactorily but an approximate formula is given, with which observed gradients from strip sources were found to agree reasonably well. The significance for plant hygiene of fungus spore dispersal is that—while attention should be paid to isolation—most emphasis ought to be placed on eliminating foci of disease within a crop.

Overhead application of fungicidal sprays (preliminary experiments), J. PALTI and S. MOELLER (*Palestine Jour. Bot.*, 4 (1944), No. 2, R. Ser., pp. 184–192).—Sprays applied through overhead irrigation pipes are reported to have satisfactorily controlled alternaria blight and oidium mildew on potatoes and downy mildew on cucumbers, giving yields at least equal to those obtained by the usual spraying methods.

Further work on plant injection for diagnostic and curative purposes, W. A. ROACH and W. O. ROBERTS (*Imp. Bur. Hort. and Plant. Crops [East Malling, Kent]*, *Tech. Commun.* 16 (1945), pp. 12–, illus. 9; also in *Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1–4, pp. 108–119, illus. 9).—Improvements (*E. S. R.*, 80, p. 496) in the appliances previously developed and used for plant injection with liquid for both diagnosis and therapy and with solid materials for therapy are described and illustrated in detail. They include the reduction in weight of small containers used for interveinal and leaf-stalk injection by substituting cellophane for glass. Special tools for making the cellophane cups are also described and illustrated. Brief notes are given on the experience gained in England and South Africa for the use of injection methods with 25 different kinds of plants—fruit trees and bushes, some forage plants, hops, potatoes, tomatoes, tobacco, and a few others. An improved method for injecting solids for curative purposes into trees is described and figured. It consists in drilling a small hole through the bark, continuing it at a slightly

decreased diameter into the wood, introducing with the help of a metal tube and plunger the necessary chemicals in tablet form into the wood, and finally sealing them there with a cork disk over which the bark readily heals. By this method a minimum of damage is done to the tree.

List of common British plant diseases (*Cambridge, Eng.: Univ. Press, 1944, pp. 61*).—An annotated list by common names of host plants, with indexes to foreign names of diseases and to Latin names of pathogens and hosts.

Diseases of cereals, flax, and other crops in South Dakota in 1943, W. F. BUCHHOLTZ. (*S. Dak. State Col.*). (*S. Dak. Acad. Sci. Proc.*, 24 (1944), pp. 98-107).—A seasonal summary of the disease situation for cereals, flax, potato, tomato, cottonwood, ash, apple, etc.

The occurrence of *Ustilago nigra* on barley in Palestine, G. MINZ (*Palestine Jour. Bot.*, 4 (1944), No. 2, R Ser., pp. 205-206).

Trials for the control of covered smut of barley by seed dressings, I. REICHERT, G. MINZ, and J. PALT (*Palestine Jour. Bot.*, 4 (1944), No. 2, R Ser., pp. 171-174).—In the six trials against *Ustilago hordei* reported, Agrosan G (2 gr. to 1-kg. of seed) was the only treatment giving consistently excellent results even under conditions conducive to severe infection. Use of sulfur gave only limited checking of smut development.

Leaf and stem spot of Egyptian clover, M. CHORIN (*Palestine Jour. Bot.*, 4 (1944), No. 2, R Ser., pp. 175-178, illus. 1).—Egyptian clover (berseem, *Trifolium alexandrinum*)—among the most important forage crops of Palestine—has in recent years suffered increasingly from a leaf and stem disease leading to the drying up of the whole plants; the symptoms are given. The causal fungus is described and referred tentatively to *Ascochyta trifolii*. Perithecia of a *Sphaerulina* were frequently found on the lesions closely associated with pycnidia of the *Ascochyta*, but their relationship is not yet clear.

On the disease resistance of wild emmer, I. REICHERT (*Palestine Jour. Bot.*, 4 (1944), No. 2, R Ser., pp. 179-183, illus. 1).—In two field tests in the central coastal plain of Palestine, seeds of at least three varieties of wild emmer (*Triticum dicoccoides*) produced a high percentage of smut-infected plants after being dusted with spores of *Tilletia tritici* from *Triticum durum melanops*. These findings are discussed in relation to the general problem of disease resistance in tetraploid and hexaploid wheat varieties.

Estudos relativos à doença "superbrotamento" ou "envassouramento" da mandioca [Studies of a disease of cassava], K. SILBERSCHMIDT and A. R. CAMPOS (*Arq. Inst. Biol. [São Paulo]*, 15 (1944), pp. 1-26, illus. 7; *Eng. abs.*, pp. 22-24).—The symptoms of this disease—first observed in Brazil in 1939—consist mainly of a severe stunting of the plant, a shortening of the internodes, and the production of extra side branches by the axillary buds; the leaf blades—sometimes reduced in size—often exhibit a slightly chlorotic appearance. Cassava plants grown from cuttings taken from affected plants developed the symptoms, and sometimes also those taken from healthy plants growing in fields where the disease was prevalent. No transmission was obtained through sap inoculations or growing plants near those which were diseased, but transfer was successful through use of diseased scions on healthy stock, the incubation period being 3 to 4 mo. Infection was also transferred by grafting from *Manihot utilisima* to *M. glaziovii*; here the incubation period was at least twice as long. It is concluded tentatively that the disease is virus-induced and that it belongs to the witches' broom group. Comparisons with reports in the literature (29 references) showed the symptoms to resemble those of cassava mosaic caused by *Manihot* virus 1, with which the disease here studied is believed to be identical.

Report of the Committee on Methods for Reporting Corn Disease Ratings, A. J. ULLSTRUP ET AL. (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin.*, 1945, pp. 5, illus. 1).

A soluble substance in cornstalks that retards growth of *Diplodia zeae* in culture. H. JOHANN and A. D. DICKSON. (U. S. D. A. coop. Wis. Expt. Sta.) (*Jour. Agr. Res. [U. S.], 71 (1945), No. 3, pp. 89-110, illus. 14*).—Data for 1935-40 are presented on 11 inbred lines and 5 single crosses of corn investigated for the presence in the stalks of an ether- or sap-soluble substance that retards the growth of *D. zeae* in culture and for seasonal changes in this substance. The ether extracts of inbreds and hybrids collected before or shortly after pollination usually retarded fungus growth more than did those of later collections. Certain lines retained more of the substance throughout maturation of the plant than did others, indicating a physiological type of resistance not necessarily associated with strength of stalk or morphological resistance. Extracts effective in retarding the spread of *D. zeae* also retarded the growth of *Gibberella zeae* and *Nigrospora sphaerica* but had little influence on the spread of *G. fujikuroi*. The growth-retarding substance in the extract proved stable to heat and soluble to some extent in water. Removal of the ears did not consistently increase, nor did clipping the leaves decrease, the growth-inhibitive effect of the ether extracts of plants so treated. Expressed juice of the stalks contained a growth-retarding substance that showed seasonal change and differed in the lines tested much as did the ether extracts. Results obtained by inoculating various inbreds and hybrids with *D. zeae* also indicated resistance to be relatively high in all lines until the time of pollination and for shorter or longer periods in different lines thereafter. The spread of the fungus was restricted in the dark lesions of resistant plants and was impeded but little in the lighter colored lesions of susceptible tissue. The chemical nature of the growth-retarding substance is unknown.

A leaf spot of tall fescue caused by a new species of *Cercospora*. J. R. HARDISON. (Oreg. Expt. Sta. and U. S. D. A.). (*Mycologia, 37 (1945), No. 4, pp. 492-494, illus. 1*).—The cause—*C. festucae* n. sp.—of a leaf spot of *Festuca elatior arundinacea* is described; the disease has thus far been mild but is of special interest because few maladies have been reported on this grass. A considerable number of plants of common meadow fescue nearby were not infected, but several plants intermediate in type between *F. elatior* and *F. elatior arundinacea* were attacked.

Anthracnose resistance in flax. C. RAY, JR. (*Phytopathology, 35 (1945), No. 9, pp. 688-694, illus. 2*).—The method used for testing seedlings with *Colletotrichum lini* is described, and 88 collections of flax are classified according to the amount of injury following inoculation. A range of types carrying anthracnose resistance was found available for breeding material; C. I. 1008, C. I. 1009, Linota, and Buda 80 proved especially free from anthracnose. Punjab in repeated tests has never had any resistant plants; Argentine types carried various degrees of resistance.

The relation of *Polyspora lini* Lafferty and *Pullularia pullulans* (de Bary) Berk. to flax browning. N. H. WHITE (*Jour. Council Sci and Indus Res [Austral.], 18 (1945), No. 2, pp. 141-149*).—The author reports isolating *P. pullulans*, *Alternaria*, and *Cladosporium* in association with dew-retting of flax affected by the browning disease in Tasmania. Cultures of *P. pullulans* were compared with those of *Polyspora lini* isolated from browning-diseased flax from Victoria, New Zealand, and Ireland; cultures bearing either name could not be distinguished by microscopic structure, cultural, serological, or physiological characters, capacity to ret flax, or pathogenicity reaction on flax. It is suggested that the two belong to the single genus *Pullularia* and that *Polyspora lini* might be referred to as *Pullularia pullulans lini*. These fungi are said to be weakly parasitic and nonpathogenic; their relation to seed disinfection and the development of browning symptoms in flax is discussed. It is suggested that browning may actually be a premature retting in the field.

Browning of flax and excess soil moisture, H. R. ANGELL (*Jour. Council Sci and Indus. Res. [Austral]*, 18 (1945), No. 2, pp. 150-152).—Browning of flax is said to be of minor importance in the flax areas of Australia. In a field test reported, browning occurred only in waterlogged drums; no disease was found in drums receiving only small or moderate amounts of water.

The occurrence of *Anguillulina dipsaci* (Kühn.) on weed hosts, including new host records in fields of oats affected by "tulip-root," L. N. STANILAND (*Ann. Appl. Biol.*, 32 (1945), No. 2, pp. 171-173).—Examination of 18 weeds in 3 oats fields affected with tulip root revealed *Galium aparine*, *Stellaria media*, *Cerastium arvense*, and *Arenaria serpyllifolia* to be hosts of *Anguillulina dipsaci*, the last two being new host records. Successful transfers of *A. dipsaci* were made from *S. media* to oats and back again to the weed; this nematode was also transferred to oats from *G. aparine* and *Arenaria serpyllifolia*.

Mass production of virus-free potatoes, J. E. VAN DER PLANK and J. W. WASSERMAN (*Nature [London]*, 155 (1945), No. 3948, pp. 794-795).—This is a brief report on the establishment of a reserve in the Union of South Africa set aside for the growing of virus-free potatoes; the project was initiated in part to provide a new and profitable industry to men returning from the war, but primarily to break away from the ordinary system of seed potato production in which the aphid-transmitted viruses are permitted in small amounts and at least those strains of virus X allowed which cause no visible mottling of the leaves. All land within 10 miles of the settlement has been added to the reserve, and entry of all unauthorized potatoes is prohibited.

Trials with bordeaux mixture, copper oxychloride, and copper oxide sprays for control of late-blight (*Phytophthora infestans*) of potatoes, G. G. TAYLOR (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 1, Sect. A, pp. 4-8, illus. 1).—Spraying with bordeaux (3-4-50) and copper oxychloride (5-100) in the Auckland district gave effective control of late blight under severe conditions, with considerable increases in yield. The 5-4-50 bordeaux formula gave no better results than the 3-4-50, nor did use of cottonseed oil with the latter formula. The evidence suggested that depressed yields from spraying with Perenox (5-100) resulted from spray damage.

Leaf roll infection in the potato varieties Skerry Champion, Shamrock, and Matador, R. MCKAY and P. E. M. CLINCH ([Ireland] *Eire Dept. Agr. Jour.*, 41 (1944), No. 2, pp. 200-208, illus. 5).

Trials for the control of powdery mildew on potatoes, J. PALTÍ and S. MORILLER (*Palestine Jour. Bot.*, 4 (1944), No. 2, R. Ser., pp. 148-156).—Among the sprays tested, two lime-sulfurs (Sulfnette and Cita Lime-Sulphur) suppressed *Oidium* sp. almost entirely on potatoes; a dispersible sulfur (Spersul) combined with the copper spray Perenox also proved effective. Alone, the copper sprays tried were less effective.

Potato dry rot and gangrene as soil-borne diseases, C. E. FOISTER, A. R. WILSON, and A. E. W. BOYD (*Nature [London]*, 155 (1945), No. 3948, pp. 793-794).—The experiments briefly reported upon show that *Fusarium caeruleum* of dry rot may be present in the soil at least 2 yr. after the last potato crop; marked variations in the degree of infestation of the soil samples were detected by the method used. Evidence is also presented that *Phoma foveata* of gangrene is also soil-borne.

Common scab of potato in dry and wet soils, G. B. SANFORD (*Sci. Agr.*, 25 (1945), No. 9, pp. 533-536, illus. 1).—The vegetative growth of *Actinomyces scabies* in steam-sterilized black loam of six moisture contents ranging from dry to wet was observed for 9 days after "seeding" the soil; growth was always best at about optimum soil moisture but surprisingly good also in both dry and wet soils. At the beginning (5 days), growth in the wet soil lagged far behind that in the

dry, but 4 days later it was equally good or better. Thus, in the absence of effective antagonism from associated saprophytes, severe scab may be expected in soils high in moisture content, as well as in drier soils

Sclerotium bataticola (Taub.) Butler on potatoes in Palestine, F. LIFTAULR (*Palestine Jour. Bot.*, 4 (1944), No. 2, R. Ser., pp. 142-147, illus. 2).

List of varieties of potatoes approved as immune from wart disease ([*Gt. Brit.*] *Min. Agr. and Fisheries*, 1944, pp. [2]).

Preliminary evaluation of some soil disinfestants for controlling southern bacterial wilt of potatoes, L. W. NIELSEN and F. A. TODD. (N. C. Expt. Sta.). (*Amer. Potato Jour.*, 22 (1945), No. 7, pp. 197-202).—Unlike Granville wilt of tobacco, caused by the same bacterium (*Pseudomonas solanacearum*) and for which clean cultivation and crop rotation offer some means of control, the occurrence of numerous wild and cultivated hosts renders similar control uncertain at best in the potato-producing area of North Carolina. The preliminary studies here reported may suggest further investigations of control through soil treatment. In addition to the controls, four treatments were used, viz, lime alone and with sulfur, modified urea, and ammonium thiocyanate. The ammonium thiocyanate, lime-urea, and sulfur treatments gave significant reductions in disease incidence. The amount of lime in the lime-urea may have been far in excess of that needed for effectiveness, and it is possible that this mixture might be improved by altering each constituent. The sulfur-lime treatment, though very effective, is believed too expensive for use on soil high in organic matter. There are, however, infested soils in eastern North Carolina which possibly could be given 1,000 lb of sulfur per acre or less and still obtain good control. The ammonium thiocyanate appeared promising and should be tested in lower dosages than those used. It is believed possible that lower amounts applied in October or November would be converted sufficiently in the soil to be nontoxic to the first planting in February or March.

A summary of research work carried out in Ireland on the potato root eelworm, J. CARROLL and E. McMAHON ([*Ireland*] *Eire Dept. Agr. Jour.*, 41 (1944), No. 2, pp. 220-228).

Observations on susceptibility of perennial rye-grass to blind-seed disease, L. CORKILL and R. E. ROSE (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 1, Sect. A, pp. 14-18, illus. 1).—Inoculations of perennial ryegrass with a conidial suspension of *Phialea temulenta* showed the susceptibility to blind-seed disease to be significantly lower in plants from four Southland old-pasture lines than in plants of certified origin. The reactions to infection appeared to be inherited, and the possibility of breeding for resistance is discussed.

A technique for the artificial inoculation of perennial rye-grass by the blind-seed organism, R. E. ROSE (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 1, Sect. A, pp. 18-22, illus. 1).—A technic is described for inoculating plants with *Phialea temulenta*. Control of humidity and temperature by a canopy of Hessian cloth over the frames permitted consistent and heavy infection of susceptible plants by artificial inoculation, enabling comparisons to be made of their reactions to the disease.

Disease testing and initial seedling selection work at the Houma Station during 1944, E. M. SUMMERS and E. V. ABBOTT. (U. S. D. A.). (*Sugar Bul.*, 23 (1945), No. 22, p. 196).—A brief progress report on the testing of sugarcane seedlings for disease resistance and adaptability to Louisiana conditions in 1944 (E. S. R., 91, p. 696).

Nuevos datos sobre el "carbon" en las distintas variedades de caña de azúcar [New information on smut in sugarcane varieties], W. E. CROSS (*Bol. Estac. Expt. Agr. Tucumán*, No. 50 (1944), pp. 35).

Temperature in relation to development and control of blue mold (*Peronospora tabacina*) of tobacco, E. E. CLAYTON and J. G. GAINES. (U. S. D. A. coop. Ga. Coastal Plain Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 71 (1945), No. 4, pp. 171-182, illus. 4).—*P. tabacina* is very responsive to temperature conditions; best sporulation was secured with an alternating temperature, 7 hr. at 77° followed by 17 hr. at 60° F. Some collections of spores germinated best at 35°-50° and others at 64°-79°; a single optimum temperature for spore germination thus apparently does not exist. Leaf infection was favored at 64°-75° and inhibited by temperatures above 85°. The disease was controlled in tobacco beds by maintaining the night temperature at or above 70°. No sporulation occurred under plant bed conditions; if, however, the light was greatly reduced the fungus sporulated freely with minimum temperatures as high as 80°. Short exposures at high temperatures were very effective in destroying the pathogen. Exposure to 110° for 4 hr. per week controlled blue mold effectively in plants which—between treatments—were constantly subject to reinfection. Exposure of plants in the greenhouse for 5 hr. per week to 105°-110°—using heat from the sun—gave complete control; heat treatment, however, was usually more expensive than use of gas or spray.

Sobre uma provável variante do vírus "Y" da batatinha (*Solanum virus* 2, Orton) que tem a peculiaridade de provocar necroses em plantas de fumo [A suspected variant of potato virus Y, cause of tobacco necrosis], N. R. NORRÉGA and K. SILBERSCHMIDT (*Arq. Inst. Biol.* [São Paulo], 15 (1944), pp. 307-330, illus. 6; *Eng. abs.*, pp. 327-329).—The most distinctive character of the disease studied was the development of a severe necrosis 1 to 2 weeks after inoculation; this was generally confined almost entirely to the smaller veinlets. Later on the affected plants became much stunted. The tobacco variety White Burley displayed these symptoms very characteristically. Sap inoculations from tobacco showing these symptoms were successful in tobacco, *Nicotiana glutinosa*, *N. langsdorffii*, *N. longiflora*, and tomato—all known to be susceptible to potato virus Y, but were unsuccessful in *Datura stramonium*—known to be immune to virus Y. The green peach and potato aphids transferred the infection from infected to healthy tobacco plants. The physical properties of this virus were very much like those of potato virus Y. The literature (20 references) dealing with virus diseases of the potato in Peru is reviewed, and attention is called to the need of further identification of potato viruses in the Andean zone—famous center of origin of edible potato tubers.

Algumas observações sobre o mecanismo da acumulação do "Nicotiana virus 1 (Mayer) Allard" em folhas de fumo [Some observations on the mechanism of accumulation of Nicotiana virus 1 in leaves of tobacco], K. SILBERSCHMIDT and H. LOPEZ TORRES (*Arq. Inst. Biol.* [São Paulo], 15 (1944), pp. 97-140, illus. 11; *Eng. abs.*, pp. 135-138).—The opposite halves of detached tobacco leaves—their petioles placed in water or nutrient solution—were inoculated with different dilutions of plant juice containing the virus, and the virus activity of the sap from these halves was compared by inoculations in leaves of *N. glutinosa*. Differences were very noticeable during the first 2 weeks after inoculation; these tended to diminish afterward but did not disappear entirely, at least in tests with tobacco varieties susceptible to mosaic. This permanent effect of the concentration of inoculum on the virus activity of the inoculated leaves was one of the significant results of the study. Neither the general mechanism of virus accumulation in the leaves nor the relation of the rates of this increase between the leaf halves appeared to be influenced in any special way by the mode of nutrition of the leaves or by variations in temperature during the observation period. Under the experimental conditions used, whole tobacco plants inoculated with high dilutions of the virus-containing juice frequently displayed less pronounced symptoms than similar plants treated with high concentrations of inoculum. These observations, as well as some

recent reports in the literature (18 references), are believed to substantiate the hypothesis that the concentration of inoculum has a greater influence on the severity of the symptoms than hitherto admitted. In the succeeding discussion the authors endeavor to explain their results through the theory of autocatalytic virus multiplication in infected plants.

Bunt reaction of hard red winter wheats in 1938-42, K. S. QUISENBERRY, H. A. RODENHISER, and C. O. JOHNSTON. (U. S. D. A. coop. Tex., Okla., Kans., Colo., Nebr., Minn., Mont., Utah, and W. Va. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 7, pp. 514-522).—A large number of varieties and strains of hard red winter wheat were tested at several stations in the Great Plains, as well as in West Virginia, Maryland, and Utah, the inoculum being a composite of collections of *Tilletia foetida* and *T. caries* from fields selected at random throughout the State in which the tests were made. No variety proved free of bunt in all tests, but a number exhibited considerable resistance. Selections from such crosses as Hope × Turkey 1069, H44 × Minturki, Ora × Tenmarq, Martin × Tenmarq, and Blackhull × Oro were rather highly resistant. Since only bulk inoculum was used, these tests should be looked on as preliminary. When tested with dwarf bunt at Logan, Utah, four strains proved as resistant as Relief and eight as resistant as Hussar. Most of these wheats had Hussar, Martin, or Ridit as one parent.

The effect of leaf rust on the yield and quality of wheat, B. PETURSON, M. NEWTON, and A. G. O. WHITESIDE (*Canad. Jour. Res.*, 23 (1945), No. 4, Sect. C, pp. 105-114).—In field tests at Winnipeg, heavy artificially induced infection of leaf rust (*Puccinia triticea*) in wheat reduced the yield, bushel and kernel weights, number of kernels per head, and percentage of flour yield of the varieties Thatcher, Apex, Renown, and Regent. Infection increased the yellow pigment content of the flour, but apart from a reduction in flour yield had no other adverse effect on the milling and baking qualities of the grain; in fact, the milled flour proved superior in baking strength to that from nonrusted samples. In the field, the rust had a variable effect on the percentage of protein in the grain; in one year it increased, in two other years it decreased, the protein percentage. In the greenhouse, during two years, leaf rust on Thatcher wheat reduced the yield of seed, number of kernels per head, number of fertile tillers, and yield of straw, but increased the protein content of the seed, leaves, and straw.

Rhizomatous grass weeds and *Ophiobolus graminis* Sacc., A. G. WALKER (*Ann. Appl. Biol.*, 32 (1945), No. 2, pp. 177-178).—The author gives an account of the infection of grass weeds by the take-all fungus in a wheat crop affected by the disease; he found the fungus to be carried by the rhizomatous grasses *Agropyron repens* and *Agrostis* spp., as well as by *Holcus lanatus*. Examination demonstrated the importance of *Agrostis* spp. in carrying over the mycelium in the field.

Sclerotinia minor on lettuce and beans, D. SERENI (*Palestine Jour. Bot.*, 4 (1944), No. 2, R. Ser., pp. 77-95, illus. 6).—A general study of *S. minor* isolated from soft rot of lettuce and blight of beans in a number of Palestine localities, including culture relationships and successful inoculations of lettuce, beans, and potatoes, as well as fruits of oranges, pears, bananas, and others.

The longevity of the pathogen causing the wilt of the common bean, W. H. BURKHOLDER. (Cornell Univ.). (*Phytopathology*, 35 (1945), No. 9, pp. 743-744).—White Marrow bean seed infected with *Corynebacterium flaccumfaciens* yielded viable and virulent bacteria after storage at room temperature in a glass container up to 24 yr.

The infected root-hair count for estimating the activity of *Plasmodiophora brassicae* Woron. in the soil, G. SAMUEL and S. D. GARRETT (*Ann. Appl. Biol.*, 32 (1945), No. 2, pp. 96-101, illus. 7).—This method of estimating the relative numbers of *P. brassicae* spores germinating in different soils involves the counting

of infected root hairs. Cabbage seedlings are grown for a week at 25° C. in glass tumblers of the infested soils; after washing out, the tap roots are stained in 1 percent aceto-carmin and a count is made of the number of root hairs containing zoosporangia of the fungus along 2 cm. of the root. In this way it is possible, for example, to study the action of different bases in inhibiting root hair infection; the main inhibiting factor was found to be soil alkalinity, however produced. Other factors influenced infection to a lesser degree; thus the number of infected root hairs was reduced in soils receiving N/10 sodium and potassium chlorides instead of distilled water. Root hair infection was also reduced by low soil moisture.

Diseases of seed cauliflower in California, W. C. SNYDER and K. F. BAKER. (Univ. Calif.). (*Seed World*, 57 (1945), No. 10, pp. 40-43).—A brief survey of cauliflower diseases in the seed-producing areas of the State, including information on diseases not found there.

Insect transmission, host range, and properties of the crinkle-leaf strain of western-celery-mosaic virus, J. H. FREITAG and H. H. P. SEVERIN (*Hilgardia* [California Sta.], 16 (1945), No. 8, pp. 361-370, illus. 1).—Studies of the host ranges, properties, and transmission of viruses by aphids and by mechanical inoculation indicated that celery crinkle-leaf mosaic is a strain of the western-celery-mosaic virus. The host range of celery crinkle-leaf mosaic is limited to umbelliferous plants. Symptoms consist of yellow mottling, leaf crinkling, raised blisterlike areas, and pronounced vein clearing. Thermal inactivation of the virus occurred at 60° C. in 10-min. exposures; its tolerance to dilution was 1:100, and it remained active in vitro at room temperature for 3 days. The virus was less readily transmitted by aphids than by mechanical inoculation—extracted celery juice producing infection in 84.7 percent of the celery plants inoculated. Only 6 of 11 species of aphids tested proved to be vectors; these infected only 8.1 percent of the plants inoculated. The 6 aphid vectors were *Aphis apigraveolens* Essig, *A. ferruginea-striata* Essig, *Rhopalosiphum conii* (Dvd.), *Myzus circumflexus* (Buck.), *M. convolvuli* (Kalt.), and the green peach aphid. Three species retained the virus the first 24 hr. but failed to infect a second lot of plants the next day or a third lot the following week.

Transmission of celery-yellow-spot virus by the honeysuckle aphid *Rhopalosiphum conii* (Dvd.), J. H. FREITAG and H. H. P. SEVERIN (*Hilgardia* [California Sta.], 16 (1945), No. 8, pp. 373-384, illus. 3).—Garden celery and parsnip and poisonhemlock (*Conium maculatum*) were found spontaneously infected with the celery-yellow-spot virus. On celery the symptoms are irregular areas or spots, or stripes at first pale green, later yellow, and finally white; they occur along the veins and are scattered over the leaflets. The virus was recovered from 25 poisonhemlock plants, which were symptomless carriers, and transmitted via *R. conii* to 126 of 205 celery plants. Mechanical inoculations from infected poisonhemlock plants failed. Attempts to transmit the virus from celery to celery by nine species of aphids and by mechanical inoculation failed to produce infection in the 615 celery plants tested. Honeysuckle aphids collected on infected poisonhemlock plants and transferred daily to successive healthy celery plants retained the virus for 12 days. There are 17 references.

Poison-hemlock-ringspot virus and its transmission by aphids to celery, J. H. FREITAG and H. H. P. SEVERIN (*Hilgardia* [California Sta.], 16 (1945), No. 8, pp. 387-405, illus. 4).—This virus was found to have a limited host range; only seven umbelliferous species succumbed to experimental inoculation. The symptoms consisted mainly of chlorotic line and ring patterns. The virus was mechanically transmitted from parsley to parsley, but could not be thus transmitted from poisonhemlock (*Conium maculatum*) and celery. The following 11 species of aphids that breed spontaneously on celery were shown to be vectors of the virus, viz, the cotton, potato, and green peach aphids and *Aphis apigraveolens* Essig, *A. apii* Theo.,

A. ferruginea-striata Essig, *A. middletonii* Thos., *Cavariella capreae* (Fab.), *Mysus circumflexus* (Buck.), *M. convolvuli* (Kalt.), and *Rhopalosiphum conii* (Dvd.). The last named (honeysuckle aphid) transmitted the virus during feeding periods of 5, 10, and 15 min. on each diseased and healthy plant; 4 species lost it during the first 24 hr. on healthy plants, whereas 5 infected a low percentage of plants during the second 24 hr., but none infected any after 24 hr. The same honeysuckle aphids which had infected celery were able to recover virus from plants 3 days after inoculation. Since the minimum incubation period in plants was 7 days, it is seen that aphids can acquire the virus before symptoms develop; they also acquired the virus as readily 180 days after infection as during the first 20 days.

Fusarium sambucinum Fkl. f. 6 Wr. as a pathogen of some species of the Cucurbitaceae, L. E. TYNER (*Sci. Agr.*, 25 (1945), No. 9, pp. 537-541).—This fungus was isolated from the stems of wilted marrow plants and—in greenhouse and field tests—shown to attack severely and destroy the lower stem portion of marrow, squash, pumpkin, muskmelon, and cucumber plants. Other isolates from diseased potato tubers and alfalfa roots were not found pathogenic to any of the above cucurbits. This appears to be the first record of a physiologic form of this species acting as a major pathogen of cucurbits.

Mycosphaerella black rot of cucurbits, J. S. WIAINT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 5, pp. 193-213, illus. 7).—During this investigation (1938-42) mycosphaerella black rot (*Mycosphaerella citrullina*) was found chiefly responsible for the serious losses from decay frequently observed in Puerto Rican and Cuban cucumbers arriving on the New York market. A review of the literature (37 references) shows the pathogen to be widely distributed and to attack many economically important cucurbits. Symptoms may include leaf spotting, cankers on stems, petioles, and fruitstalks, decay of the stem, wilt, and fruit rot. The decay was also found on balsam pear, chayote, Chinese preserving melon, Yellow Crook-neck squash, and watermelon from Cuba; chayote from Jamaica and Puerto Rico; and muskmelon presumably from Venezuela. It was noted only once on domestic cucumbers and not at all on domestic muskmelons. The decay came to attention twice on domestic Hubbard squash, but was not observed on domestic watermelon during the course of limited observations.

The symptoms on cucumbers are described and illustrated in detail and to a lesser extent those on balsam pear, chayote, dishcloth gourd, muskmelon, and squash. Development of the pathogen on cucurbit fruits and its cultural behavior on natural and artificial media are also described and illustrated. The pathogen grew more rapidly in culture at 65°-85° F., with the maximum at 80°; no growth occurred at 95°. Growth was markedly reduced at 45° and was only slight at 40°; no growth occurred in 6 weeks at 35°. The development of decay in cucumber fruits was very slow at 45°; none took place at 35° or 40°. Rapid increase in decay occurred at 50° and 55°. The author suggests field control through seed treatment and spraying, care in picking and packing to avoid mechanical injuries, prompt handling after picking, precooling to 50° or somewhat lower, and maintaining temperatures at 40°-45° during transit to market.

Field trials for the control of downy and powdery mildew of cucumbers.—I, On the efficacy of various copper compounds, I. REICHERT, J. PALTI, and G. MINZ (*Palestine Jour. Bot.*, 4 (1944), No. 2, R Ser., pp. 96-116, illus. 1).—Various copper compounds—including bordeaux—were used in spraying and dusting trials against *Peronospora cubensis* and *Erysiphe cichoracearum* on cucumbers in the Palestine coastal plain. Best control of the former was given by Perenox, which was also the only one satisfactorily controlling the latter disease.

On the specialization of *Bremia lactucae* on Compositae, L. LING and M. C. TAI (*Brit. Mycol. Soc. Trans.*, 28 (1945), pt. 1-2, pp. 16-25, illus. 4).—The *Bremias*

collected near Chengtu, China, from several genera of composites were placed in three groups, depending on the dimensions of the sporangia. The fungus from *Saussurea* was regarded as a distinct species, *B. saussureae*; the others, as *B. lactucae* and its forms. Cross inoculations were successful between *Lactuca sativa* and *L. indica*, but the other isolations were specialized to their natural host plants.

Field trials for the control of tomato leaf diseases, I. REICHERT, J. PALT, G. MINZ, ET AL. (*Palestine Jour. Bot.*, 4 (1944), No. 2, R Ser., pp. 117-141).—The detailed results of spraying trials in the Jordan Valley and coastal plain areas of Palestine against powdery mildew (*Leveillula taurica*) and leaf mold (*Cladosporium fulvum*) are presented.

Cyanogas injury to tomato plants influenced by potash fertilization, J. B. HESTER (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 4, p. 319, illus. 1).—Only K-deficient tomato plants were injured by the greenhouse fumigation reported.

Observations on pest control in 1944, E. J. RASMUSSEN (*Mich. State Hort. Soc. Ann. Rpt.*, 71 (1944), pp. 30-40).—A brief seasonal summary of work on the control of orchard pests and diseases and on the influence of "stop-drop" sprays in prolonging the harvesting period.

Airplane dusting for the control of orchard fruit diseases, F. C. STRONG and E. J. RASMUSSEN (*Mich. State Hort. Soc. Ann. Rpt.*, 74 (1944), pp. 53-59).—A report of 1 year's tests.

The occurrence of apple and pear scab in Palestine in relation to weather conditions, J. PERLBERGER (*Palestine Jour. Bot.*, 4 (1944), No. 2, R Ser., pp. 157-161, illus. 2).—The conidial stages alone of the apple and pear scab fungi have been reported from Palestine and these only on local varieties; European varieties are said to remain free of infection because of weather conditions unfavorable to the pathogens.

Certain aspects of resistance of plum trees to bacterial canker, II, III (*Ann. Appl. Biol.*, 32 (1945), No. 2, pp. 112-123, illus. 2).—A continuation of the series (E. S. R., 93, p. 453).

II. *On the nature of the bacterial invasion of Prunus sp. by Pseudomonas mors-prunorum* Wormald, D. Erikson (pp. 112-117).—The author reports a detailed study of the necrotic areas induced in the stems of a resistant and susceptible variety inoculated with *P. mors-prunorum*. The pathogen penetrated intercellularly, plasmolyzing the cell contents, disintegrating the cell walls, and gradually invading the disorganized tissues. The maximum cankers caused by winter inoculations in the susceptible host appeared in spring. Limitation of necrosis occurred in summer, generally accompanied by production of new tissue composed of xylem elements. Live bacteria were isolated in fall from cankers in which the necrotic area had extended into the woody cylinder beyond the limiting periderm. The difference in injury to the tissues of the resistant trees was quantitative rather than qualitative. The significance of the apparently more efficient host mechanism of periderm production in this variety is considered. Lesions similar in histological aspect were obtained from injection of cell-free filtrates of cultures of the pathogen.

III. *The action of cell-free filtrates of Pseudomonas mors-prunorum Wormald and related phyto-pathogenic bacteria on plum trees*, D. Erikson and H. B. S. Montgomery (pp. 117-123).—A technic for introducing 2 to 3 cc. of liquid into the bark of plum trees is described. Parallel injections with dyestuff throughout the spring failed to afford a reliable index of the invasive powers of the various test fluids introduced in this manner. A susceptible variety exhibited greater injury by cell-free filtrates of *P. mors-prunorum* than did a resistant variety; the latter showed negligible injury. The greatest injuries were caused by filtrates of cultures 5 weeks or more old, especially when concentrated. Of other bacteria tested, *P. prunicola*, some *P. syringae* strains, and *Bacterium pruni* yielded damaging filtrates; *P. tabaci*,

P. fluorescens, *P. marginalis*, *P. phaseolicola*, *P. tumefaciens*, *P. pisi*, *P. cerasi*, and certain strains of *P. syringae* did not. Some evidence is given that the deleterious activity of *P. mors-prunorum* may be due in part to an endotoxin of protein nature obtained from the dried bacterial cells by acetic acid extraction.

Fruit gumming of *Victoria plums*.—Progress report V. W. B. ADAM and D. DICKINSON (Univ. Bristol, Fruit and Veg. Preserv. Res. Sta., Campden, Ann. Rpt., 1944, pp. 12-19, illus. 1).—Reporting further studies (E. S. R., 90, p. 355), the authors found that the frequency of gumming increased directly with the rainfall during the later stages of ripening.

On the spread of crinkle in Royal Sovereign strawberries in south-west England. A. BEAUMONT and L. N. STANLAND (Ann. Appl. Biol., 32 (1945), No. 2, pp. 123-127, illus. 4).—Observations of marked plants at periodic intervals indicated that the maximum appearance of symptoms occurs in June-July. The findings suggest that summer infection spread by apterous aphids passing on to neighboring plants is probably the principal mode of transfer of this virus disease.

Blueberry stunt disease. S. JOHNSTON, D. CATTON, and C. A. BOYER (Michigan Sta. Quart. Bul., 27 (1945), No. 4, pp. 409-412).—This virus disease of the blueberry is said to be a potentially serious menace to cultivated blueberries. Fortunately, field surveys have shown that it is not well established in Michigan and thus far has not spread rapidly. It is suggested that growers should plan an annual inspection of their fields by personnel of the State Department of Agriculture as an insurance against its further spread.

Further tests of organic fungicides for control of cranberry fruit rot. R. B. WILCOX. (U. S. D. A.). (Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg., 75 (1945), pp. 16-22).—Fermate again (E. S. R., 92, p. 72) proved much superior to bordeaux; presumably about three times as much in the form of dust would be required to give the same control as in the form of spray. Dithane A-10 proved about as effective as Fermate; Dithane B-11 controlled field and early storage rots satisfactorily, but was less effective than Fermate for end-rot control. U. S. Rubber No. 604 was more effective than Fermate against rot, but retarded the coloring of the fruit. With all fungicides tested, end rot was less amenable to control than were the rots appearing in the field or shortly after harvest. The 3-100 concentration of Fermate would appear to be required only where experience has shown rot to be very severe and hard to control or where it is expected that the berries will be stored for sometime before put on the fresh-fruit market. For berries to be processed or marketed promptly the 2-100 formula appears to be ample, even for severe rot; where little rot usually occurs and bordeaux has given satisfactory control, 1-100 Fermate should be sufficient. Synthetic organic fungicides other than Fermate cannot be recommended for commercial use until they have undergone further testing.

The cup fungus, *Ciboria carunculoides*, pathogenic on mulberry fruits. H. H. WHETZEL and F. A. WOLF. (Cornell Univ. et al.). (Mycologia, 37 (1945), No. 4, pp. 476-491, illus. 4).—As a result of this study, the organism is transferred from *Sclerotinia* to *Ciboria* as *C. carunculoides* n. comb. It possesses both sclerotial and apothecial phases but lacks conidia. Its ascospores—which are forcibly expelled—lodge on the stigmas and initiate infection at time of flowering; as a result each drupelet may become transformed into a separate sclerotium. The sclerotia are composed of both fungus and host tissues and somewhat resemble grains of popcorn. Apothecia for the succeeding year are initiated in spring, about a month after ascospore discharge; they originate from elements of a mantle that occurs immediately beneath the outer tissues normally destined to become the fleshy portion of the mulberry fruit. This mantle completely invests the young sclerotium and consists of spermatophores with interspersed archicarpis; the spermatia are produced in such abundance as to be extruded in a column at the tip of each sclerotium.

Sclerotia fall to the ground during midsummer, become black, and remain dormant until spring. Breaking of dormancy is first indicated by increase in size; this is accounted for by the presence of a gelatinous covering on the hyphae which absorbs water—causing the sclerotia to swell—and also functions in maintaining turgor during expulsion of the ascospores. The ascospores possess thick gelatinous envelopes, causing them to adhere and providing moisture for germination. An Asiatic fungus, *S. shiraiana*, also parasitic on mulberry, appears distinct from the one here studied but properly belongs to the same genus; it is here transferred to *C. shiraiana*.

A new species of *Cephalosporium* causing persimmon wilt, B. S. CRANDALL. (U. S. D. A.). (*Mycologia*, 37 (1945), No. 4, pp. 495-498, illus. 1).—*C. diospyri* n. sp., found causing a serious wilt disease of American persimmon, is described; the Oriental persimmon (*Diospyros kaki*) is nearly immune but was often killed when grafted on susceptible roots. Inoculations indicated other species of *Diospyros* to be more or less susceptible.

A gummosis of citrus associated with wood necrosis, G. H. GODFREY. (Tex. Expt. Sta.). (*Science*, 102 (1945), No. 2640, p. 130).—This gummosis and wood necrosis—found common in sweet orange, grapefruit, and the Meyer lemon—is said to be the most prevalent and serious disease of citrus in the Lower Rio Grande Valley. Hyphae of extremely small diameter and what appear to be spores were found in affected wood; the organism is suggestive of an *Actinomyces* in appearance. It has not yet been isolated in culture, but inoculations with affected wood as the inoculum have been successful. The downward spread in the trunk appears to stop at the line of bud union; the sour orange stock would thus appear to be immune. It seems clear that the malady is parasitic in origin.

Pathogenicity of *Diplodia* from various hosts to citrus fruits, G. MINZ and Y. BEN-MEIR (*Palestine Jour. Bot.*, 4 (1944), No. 2, R. Ser., pp. 162-165).—In the tests reported *Diplodia* stem-end rot of oranges, lemons, and grapefruits was induced by spores not only from twigs and branches of other species of citrus tested, but also—except for the date palm, *Mentha piperita*, and *Pyrus syriaca*—from all the hosts used, including apple, pear, quince, rose, grape, castor bean, peanut, acacia, loquat, mango, banana, euphorbia, Persian walnut, *Morus* spp., and *Ficus* spp.

Observações sobre o "quick decline" dos citrus na California, C. M. FRANCO (*Biológico*, 11 (1945), No. 5, pp. 135-137).

Transmisión y naturaleza de la "lepra explosiva" del naranjo [Transmission and nature of lepra explosiva of the orange], A. R. VERGANI (*Argentina Min. Agr., Inst. Sanidad Veg.*, 1 (1945), No. 3, Ser. A, pp. 10+, illus. 4).—The disease was induced by experimentally exposing oranges to *Tenuipalpus pseudocuneatus* (Acarina). The author believes from the evidence presented that it is caused by a toxic agent produced by this acarine pest.

Anatomical study of the button of Shamouti oranges in relation to stem-end rot, M. NADIEL (*Palestine Jour. Bot.*, 4 (1944), No. 2, R. Ser., pp. 166-170, illus. 1).—No mycelium was ever found present in the inner tissues of the button of picked fruit, but it occurred in the axil of sepals within the torn necrotic tissue forming at the point at which petals and stamens had been previously attached and sometimes also on other external parts of the button. The occurrence of mycelium on these parts was also accompanied by the presence of a cork layer separating the necrotic tissue and mycelium from healthy tissue; this cork was shown to form in response to mechanical injury (pin pricks) as well as to fungus invasion. This mycelium on the button was found to belong to the fungi of stem-end rot (*Diplodia natalensis*, *Alternaria* sp., or *Colletotrichum gloeosporioides*); it thus constitutes a source of latent infection which may develop in storage.

Summary of 1944 gladiolus disease control studies in Illinois, D. B. CREAGER (*Gladiolus Sup.* [New England Gladiolus Soc.], 9 (1945), No. 1, pp. 3-5; also in *Ill. Gladiolus Soc. Notebook*, 3 (1945), No. 2, pp. 12-13).

Botrytis convoluta causes winter rhizome rot, L. DOSDALL. (Univ. Minn.). (*Amer. Iris Soc. Bul.* 97 (1945), pp. 11-16, illus. 3).—A brief presentation of the history of this iris disease, its present status in Minnesota, and its control by rhizome treatment with Semesan, mercuric chloride, or calomel.

The phytophthora root disease of chestnut and chinkapin, G. F. GRAVATT and B. S. CRANDALL. (U. S. D. A. et al.). (*North. Nut Growers Assoc. Ann. Rpt.*, 35 (1944), pp. 83-87, illus. 1).—About a hundred years ago a serious malady of the European chestnut, later known as "ink disease," was reported in Portugal; subsequently the same disease was found in various parts of the continent and in England. In 1917 an Italian pathologist proved the cause to be *Phytophthora cambivora*; later a closely related species, *P. cinnamomi*, was found causing a practically identical root disease of chestnuts in Europe. During the same period an extensive dying of the American chestnut and chinkapin in the southern United States has been in progress, and its history is briefly summarized. Inoculations with *P. cinnamomi* on various species have shown the American and European chestnut and six native species of chinkapin all to be rather susceptible; on the other hand, selections of four oriental species of *Castanea* proved highly resistant. The symptoms, practical importance in the Eastern States and on the Pacific coast, and the susceptibility of other hosts are discussed. It is believed doubtful whether the disease can be controlled in a chestnut orchard planting of susceptible varieties where conditions are favorable to the fungus. The development of the disease was studied in detail in an orchard in central Georgia; here it was found that frequently the death of the tree occurred because most of the lateral and deeper roots had been girdled by the fungus without the collar region becoming involved. The method of applying copper carbonate around the collar, tried in Spain, might possibly be of value for less susceptible hosts than the American chestnut.

Recommendations for control of canker stain of planetrees, J. M. WALTER (U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., 1945, pp. 2).

Staining a spray of film on conifer needles, I. M. FELBER. (Mich. Expt. Sta.). (*Stain Technol.* 20 (1945), No. 3, pp. 77-79, illus. 2).—Preliminary to an investigation designed to reveal the coverage of a spray film on conifer needles after varying periods of weathering, it became necessary to find a microtechnic which would leave the spray coat unaltered and yet differentiate it from the underlying tissues; obviously the usual operations of killing and embedding were not applicable. The particular spray used was an oil-in-water emulsion developed to reduce transpiration from foliage. The procedure proving successful and here described is said to be applicable to other problems concerned with similar protective agents.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wildlife and the farming industry, W. P. TAYLOR (*Kans. State Bd. Agr. Rpt.*, 64 (1945), No. 266, pp. 21-31).—An address discussing farm lands from such standpoints as range management, hunting, trapping, and fishing—including the value of the farm fish pond, with discussion.

Relative values of drained and undrained bottomland in Illinois, F. C. BELL-ROSE, JR. (Ill. Nat. Hist. Survey). (*Jour. Wildlife Mgmt.*, 9 (1945), No. 3, pp. 161-182, illus. 3).—The study here reported was made on Rice Lake, a 1,034-acre bottom land lake in the Illinois River Valley—a good muskrat area of average value for duck hunting and fishing but little utilized for commercial fishing. On the basis of the findings, the author recommends that Federal and State wildlife agencies accelerate research on the management of wet lands and place the results in readable form for landowners; the latter would then be less likely to drain or condone drainage, and many owners of drained wet lands—relatively unprofitable

under cultivation—would be interested in restoring the marshes or lakes. Agencies concerned with flood control and land use should seriously consider restoring unprofitable drained areas which make for increased flood heights. "Despite all the Federal expenditure on levees and drainage districts in the Illinois and Mississippi River Valleys, the flood and economic problems continue, and little has been done toward a lasting solution of flood problems there. The purchase and establishment of certain districts as flood reservoirs and flowage ways would be a start toward this end. Such areas would aid in lowering flood heights and also furnish a comparatively high economic return from the harvest of aquatic resources; in addition, they would be of great value to local residents by providing much-needed recreation grounds."

[Brief articles on wildlife] (*Jour. Wildlife Mgmt.*, 9 (1945), No. 3, pp. 254-258, illus. 1).—The following are included: Ratio of Reported to Unreported Duck Bands in Illinois, by F. C. Bellrose, Jr. (p. 254) (Ill. Nat. Hist. Survey); Visceral Gout a Symptom of A-Vitaminosis [in Bobwhite], by R. B. Nestler (p. 255); Flushing Tube for Determining Food of Game Birds, by D. B. Vogtman (pp. 255-257) (Oreg. State Col.); and Deer Food Produced by Ice Storm, by J. B. Curtis (pp. 257-258) (Univ. Maine et al.).

A survey of the game and furbearing animals of Oklahoma, L. G. DUCK and J. B. FLETCHER (*Okla. Game and Fish Comm., Pittman-Robertson Ser. 2 (State Bul. 3), [1945], pp. 144, illus. 99*).—This survey was carried out in the effort to provide an adequate inventory of the wildlife resources of the State as the basis of a far-reaching long-time program of game administration in which the Game and Fish Commission, in organizing its activities, recognizes scientific game management and investigation as an important part of game administration procedure. Following discussions of the general picture and the game types of Oklahoma, consideration is given in turn to bobwhite quail, prairie grouse, scaled quail, mourning dove, wild turkey, ring-necked pheasant, American woodcock, miscellaneous birds, white-tailed deer, squirrels, rabbits, miscellaneous mammals, and furbearers. Fifteen black-and-white maps illustrate various distributional data and a large colored "game-type" map shows the ecological habitats. In addition to the text and the 57 plates, further information is presented through 16 charts and 33 tables. A bibliography of 46 titles completes the work.

White-tailed deer in the Great Plains region, F. W. COOK (*Jour. Wildlife Mgmt.*, 9 (1945), No. 3, pp. 237-242).—"Reduction of white-tailed deer in the United States resulted from the curtailing of their habitat and from overshooting. The Great Plains National Wildlife Refuges provided both suitable habitat and shelter, thus contributing directly to the increase in deer populations. Management of the deer entails not only securing their increase, but also maintaining their numbers at a level compatible with the available food supply."

Deer management and range livestock production, L. A. STODDART and D. I. RASMUSSEN (*Utah Sta. Cir. 121 (1945), pp. 17, about 10 illus.*).—Numerous problems have arisen because of the overabundance in some areas of mule deer—Utah's major game animal. This circular presents information on livestock-deer populations, including factors influencing range production; livestock-deer competition, including food habits and range-use habits; and suggestions for solving the competition problem.

October 1944 survey of damage to cranberries by deer, D. O. BOSTER (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg.*, 75 (1945), pp. 6-8).

Seasonal fur primeness of the coyote in the western United States, M. H. MARKLEY (*Jour. Wildlife Mgmt.*, 9 (1945), No. 3, pp. 227-231).—This study dealt with 5,621 pelts taken by Federal hunters in the 11 Western States during August 1940-April 1941. The data are listed under southwestern, Rocky Mountain, and northwestern regions; ♂♂ predominated in the first two and ♀♀ in the last.

Pelts from coyotes trapped in September were unsatisfactory from all regions; by October the animals possess the long dense covering characteristic of the winter pelt. Except in the southwestern region, the pelt quality seems to remain high throughout the winter, until the end of March; that of animals from the Southwest seems to decrease rapidly after December. There has been a tremendous waste from improper preparation or storage of raw pelts before shipping to markets; this tendency would be more noticeable in the Southwest where climatic conditions are less severe. Because of the adaptability of the coyote to agricultural development it will undoubtedly continue of much importance in the American wild fur crop.

Reduction in productivity of muskrat pelts on an Iowa marsh through depredations of red foxes, P. L. ERRINGTON and T. G. SCOTT. (Iowa Expt. Sta. et al.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 4, pp. 137-148).—The muskrat (*Ondatra zibethicus*) constitutes a major economic resource in many parts of North America; even in midwestern agricultural communities the income from the sale of pelts often has been equal to, or actually exceeded, that from farm crops and livestock raised on adjacent lands. During the summer of 1940 a study was made of an exceptionally drastic predation by red foxes on the drought-exposed muskrat population of Wall Lake—a marsh in north-central Iowa. The severity of the crises doubtless would have resulted in heavy losses without the foxes, but to the specialized and effective hunting technics used by the latter may be ascribed a reduction in muskrat numbers that appeared to a considerable extent non-compensatory. A possible net decrease through the fox depredations of about 25 percent of the trappers' income from the marsh is indicated by the data obtained.

Diel activity rhythms of the rodents (*Microtus ochrogaster* and *Sigmodon hispidus hispidus*), J. B. CALHOUN (*Ecology*, 26 (1945), No. 3, pp. 251-273, illus. 11).—The activities of the cotton rat (*S. hispidus hispidus*) and the prairie meadow mouse (*M. ochrogaster*) were measured in an activity apparatus which recorded separately their (1) activity associated with feeding and defecation, (2) spontaneous running activity, and (3) activity in a nest cage; temperature and light were controlled. It is concluded from the detailed results that both species possess very labile nocturnal activity patterns which in their normal environment may be variously modified by meteorological or biotic factors. This lability is believed to account for the fact that many well qualified observers have come to opposite conclusions as to the diel periodism of these rodents. Their diel activity rhythms evinced similar modifications to changes in light and temperature previously demonstrated by others (31 references) for *Peromyscus*, *Mus musculus*, *M. wagneri*, *Rattus norvegicus*, and other species of *Microtus*. This points to the fact that the general characteristics of the diel activity cycles of many nocturnal rodents are probably similar, although each species has characteristics specific to its activity pattern, which must depend on its hereditary morphological and physiological organization and on the environmental influences to which it was exposed during its development.

A study of the rodent-ectoparasite population of Jacksonville, Fla., A. S. RUMREICH and R. S. WYNN (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 31, pp. 885-905, illus. 2).—This paper (including a review of previous work, with 40 references) is presented as the first of what is intended to be a series of reports on the findings of studies in individual areas; it is expected that they will serve as the basis for a systematic treatment of epidemiologic features of plague and typhus in the United States and in some of its outlying territory. The authors report on the chronology and technic of field operations at the port of Jacksonville, the composition of the 5,357 live rodents collected—among which *Rattus norvegicus* was greatly in preponderance, statistical studies including the definition and deriva-

tion of statistical constants employed and the biometrical constants of the principal host species, seasonal variation and environal factors in parasitization, and the inter-relationship of biometric constants. A report on quantitative studies of these relationships and an assay of their significance in the epidemiology of these diseases is to follow.

"Ten-eighty," a war-produced rodenticide, E. R. KALMBACH (*Science*, 102 (1945), No. 2644, pp. 232-233).—In tests of several potential rodenticides against white rats and later on captive wild Norway rats, prairie dogs, and other field rodents, sodium fluoroacetate (designed by the laboratory serial number 1080) was found extremely toxic to a variety of these mammals. "With a material as new as 1080 much remains to be learned regarding its worth and hazards. . . . It is therefore more as an expression of caution and withheld judgment than of an announcement of accomplished fact that this statement has been prepared. . . . At the present time the many unknowns regarding it and the restricted basis on which it is being produced preclude the use of 1080 by the public or even by rodent control operators generally."

The distribution and taxonomy of kangaroo rats (genus *Dipodomys*) of Utah, S. D. DURRANT and H. W. SETZER (*Utah Univ. Bul., Biol. Ser.*, 9 (1945), No. 3, pp. 39, illus. o).

Sex ratio and weights of muskrats from the Montezuma National Wildlife Refuge, H. L. DOZIER (*Jour. Wildlife Mgmt.*, 9 (1945), No. 3, pp. 232-237, illus. 4).—About 800 acres of marsh on the Montezuma National Wildlife Refuge, N. Y.—trapped during January 1-March 20, 1944—yielded 3,919 muskrats with a sex ratio of 122:100 in favor of the ♂♂. The ♂♂ were significantly heavier than the ♀♀. Muskrats from the Blackwater Refuge, Md., averaged 1.3 lb. less, this great difference being accounted for by the amount of fat on the Montezuma animals as a result of better food and water conditions rather than on the more northern location. In some of the larger muskrats about 8 oz. of fat was removed from the pelt, body, and viscera. Accurate comparisons between the weights of animals from different parts of the country cannot be made unless the amount of fat is considered. Practically all muskrats trapped on the upper pool of the refuge averaged at least a third less in weight and measurements than those in the lower pool, and they were almost completely without fat; water levels in the upper pool usually were too high for optimum muskrat requirements, especially for growth of proper food. Examination of numerous feeding shelters indicated that the favorite muskrat food on the refuge in winter was the tender, partly green, growing shoots of cattail and the main roots of both cattail and burreed. These young shoots start in late fall but remain 4 to 5 in. long, beneath the ice, until spring. They are undoubtedly a valuable source of nutrients.

The geographical distribution of Rocky Mountain spotted fever and Nuttall's cottontail in the western United States, W. L. JELLISON (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 33, pp. 958-961, illus. 1).—A close geographical association was found to exist between spotted fever and Nuttall's cottontail (*Sylvilagus nuttallii*) in the above area. In 12 Western States, 99.58 percent of the spotted fever cases occur within the range of this rabbit, which is present in 55.88 percent of the counties. Other species of cottontails are present in all States or countries where spotted fever has been recognized.

Red squirrel damage to mature red pine, T. SCHANTZ-HANSEN. (Univ. Minn.). (*Jour. Forestry*, 43 (1945), No. 8, pp. 604-605).—A note on the considerable damage to mature red pine through the cutting of branch tips by squirrels in an experimental forest in Minnesota.

Life history notes on the Florida weasel, J. C. MOORE (*Fla. Acad. Sci. Proc.*, 7 (1944), No. 4, pp. 247-263, illus. 4).

Trans-Gulf spring migration of birds and the coastal hiatus, G. H. LOWERY, JR. (La. State Univ.). (*Wilson Bul.*, 57 (1945), No. 2, pp. 92-121, illus. 8).—The author found that in spring—during favorable weather—trans-Gulf migrants that do not breed in the Gulf coast region or in the lower Mississippi Valley fail to come down immediately on reaching land but fly far inland before descending. During unfavorable weather incoming migrants of all types are precipitated, sometimes in tremendous concentrations, on the first available land; they pile up on coastal islands and cheniers, and at times even in coastal marshes and other unfavorable places. Migrants thus forced to stop on the shores resume their northward flight with the first favorable weather and pass over a vast area in the southern United States before again descending. The intermediate area therefore becomes an extensive "hiatus" in the path of the trans-Gulf fly way; within this area transient migrants are extremely rare and highly intermittent in their occurrence, or even wholly absent during many consecutive spring migrations. The lack of spring records from the Gulf coast and lower Mississippi Valley for certain species is shown to be an insufficient basis for assuming that they are not trans-Gulf migrants. These migrants that breed in the Gulf region and in the lower Mississippi Valley are regular in their arrival at their breeding grounds, although they may be rare or absent at places a few miles away. Analysis of weather conditions in the Yucatan-Campeche region preceding specific dates on which migrants are known to have been precipitated on the United States coast because of weather barriers reveals that—in all cases examined—the birds had left the Yucatan-Campeche region under auspicious conditions. For those periods when unfavorable weather is known to have extended across the Gulf to that region, the available evidence shows that the northward flow of trans-Gulf migrants was stopped, only to be resumed—and in increased magnitude—when the weather permitted. The data presented indicate that "waves" characteristic of spring migration in the Mississippi Valley are caused primarily by two factors, depending on weather conditions, viz, the alternate passing over or dropping down of migrants that is recorded in the Gulf regions and the recurrent interruptions of the stream of migrants leaving the Yucatan-Campeche region. There are 21 references.

Resistance to hunger in birds, S. C. KENDEIGH. (Univ. Ill.). (*Jour. Wildlife Mgmt.*, 9 (1945), No. 3, pp. 217-226, illus. 2).—Ability to tolerate periods when foods are scarce or unobtainable is of the utmost importance to birds, especially in winter when air temperatures may also be low, causing more energy to be used in maintaining constant body temperatures. Small wild birds do not feed in darkness, and in winter the nights may be too long and too cold for some species to survive. In this study 137 English sparrows were worked with during December-March, and the results are presented in detail. Differences between species and individuals of one species in survival time without food are due to differences in the relative amount of utilizable fat stored in their bodies and in the rate at which it is metabolized. Adjustments in behavior may compensate in part for deficiencies in physiological vigor and modify the controlling role of temperature and of hunger on distribution, migration, and abundance.

Birds of Georgia: A preliminary check-list and bibliography of Georgia ornithology, E. R. GREENE, W. W. GRIFFIN, E. P. ODUM, H. L. STODDARD, and I. R. TOMKINS (*Athens: Univ. Ga. Press*, 1945, pp. 111, illus. 2).—An annotated list and an annotated bibliography, with a historical narrative by E. E. Murphey.

Duck damage, S. SAUGSTAD (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 6, pp. 17-20, illus. 2).—Damage by ducks to cereal crops is reported to have become an increasingly serious problem during recent years in several sections of North Dakota. The species observed by the author throughout the summer of 1944 included mallards, pintails, blue-winged teals, and shovelers; the yields of durum wheat were

estimated to have been reduced by 12 to 13 bu. per acre over an area of nearly 100 acres, representing at current prices an aggregate loss of about \$1,400. The ducks did not actually consume a large portion of the wheat that was lost; much of it was shattered out of the heads and left on the ground. Further damage resulted from trampling the windrowed straw to such an extent that it was in close contact with the ground, entailing further aftereffects such as deterioration of the grain still remaining on the heads. A still more serious complication was the effect of sprouting and growing of the shattered kernels lying on the ground beneath the windrows, rendering it difficult or impossible to pick up the windrow. Furthermore, the operation of certain types of grain separators was greatly reduced in efficiency. The ducks evidently began feeding near the center of the field and worked outward, so that the damage was not readily discernible from the edges. The only periods of the day when they appeared in great numbers were early dawn and well after sundown. In this particular instance the damage was almost exclusively to windrowed durum wheat, leaving the intervening strips of windrowed barley almost untouched.

Aspergillosis and parasitism in a gull, F. R. BEAUDETTE. (N. J. Expt. Stas.). (*Bird-Banding*, 16 (1945), No. 3, pp. 99-101).—Notes on the isolation of *Aspergillus fumigatus* from a herring gull—believed to be the cause of its death—and on helminth parasites found on autopsy.

Population trends and blood parasites of ruffed grouse in Ontario, A. M. FALLIS (*Jour. Wildlife Mgmt.*, 9 (1945), No. 3, pp. 203-206, illus. 5).—The population of the ruffed grouse (*Bonasa umbellus*) has recently been falling off in Ontario. This is a preliminary report on a survey of the blood parasites of birds collected during October-November, 1942-43, and their possible relation to the population trends.

Minimum intensities of illumination under which owls can find dead prey by sight, L. R. DICE (*Amer. Nat.*, 79 (1945), No. 784, pp. 385-416).—All four species of owls studied in the laboratory found their dead prey mostly by sight, and there was no evidence of their using for this purpose the infrared rays or any senses other than sight and physical contact. The barred, long-eared, and barn owls were able under the most favorable conditions to see and approach dead prey directly from a distance of 6 ft. or more under an illumination calculated to be as low as 0.000,000,73 ft.-c.; when, however, it was reduced to 0.000,000,53 ft.-c. all these owls appeared to have some difficulty in seeing prey more than about a foot away. There was limited evidence that sight may be of some value to the barred owl in finding dark-colored dead prey on nearly white soil in light as dim as 0.000,000,15 ft.-c. The burrowing owl was unable to find dead prey regularly under lights dimmer than about 0.000,026 ft.-c.; this species, however, is more diurnal in habit than the other three and it also lives in more open situations. From measurements of the incident light in nature it was calculated that in the natural habitats of all four owls the light intensity must often fall below the minimum at which they can see their prey.

Adaptability of the chukar partridge to Missouri conditions, W. O. NAGEL. (Univ. Mo. et al.). (*Jour. Wildlife Mgmt.*, 9 (1945), No. 3, pp. 207-216, illus. 1).—This bird (*Alectoris graeca chukar*) was introduced into Missouri in 1934. Most of the birds reared or released left the areas, scattered widely, and continued to move without settling; whatever was responsible, this dispersal was the primary factor in the failure of establishment. Chukars also proved susceptible to common diseases of poultry and game birds. It soon became clear that if established, they would be in localities also favorable to bobwhite. Similarity in food habits of the two also suggested that chukars, if abundant, would compete strongly with quail for food. This was the principal reason influencing the decision to cease releasing chukars

when the stock on hand was exhausted. In view of a relatively low mortality and good productivity, they would probably have become established in some places if they had remained on the areas in numbers approaching those released.

A versatile boat for waterfowl management and research, C. S. WILLIAMS and G. H. JENSEN (*Jour. Wildlife Mgmt.*, 9 (1945), No. 3, pp. 191-192, illus. 2).—The boat and its varied uses are described and illustrated.

"Paul Bunyan" rake for removal of marginal vegetation in botulism control, B. M. HAZELTINE and V. EKDAHL (*Jour. Wildlife Mgmt.*, 9 (1945), No. 3, pp. 193-195, illus. 3).—Laboratory and field tests have revealed that decaying vegetation directly influences the devastating outbreaks of botulism among migratory waterfowl. The tool developed and here described and illustrated has been used successfully in removing massive drifts of this material. With further use of this machine other improvements will doubtless be made, and the results may contribute materially to the control of botulism.

The subspecies and intergrades of the Florida burrowing crayfish (*Procambarus rogersi* (Hobbs)), H. H. HOBBS, JR. (Univ. Fla.). (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 8, pp. 247-260, illus. 34).—Includes full descriptions of two new subspecies.

Conditions governing the distribution of insects in the free atmosphere, III, IV, W. G. WELLINGTON (*Canad. Ent.*, 77 (1945), Nos. 3, pp. 44-49; 4, pp. 69-74).—A continuation of the series (E. S. R., 93, p. 462).

III. *Thermal convection*.—Of the various types of convective processes, thermal convection is said to be the most important to insect distribution; these processes are the only kinds whereby insects may be subjected to temperature extremes. Previous experiments on insect resistance to rapid freezings—with ice accretion—and partial thawings, when coupled with the known properties of convection, show that insects other than the soft-bodied ones may withstand even thundercloud conditions. Except for heat thunderstorms and the special radiative effects of cities and woods, thermal convection is a diurnal phenomenon; the maximum numbers of insects would be looked for aloft at the afternoon peak of the process. Convection is the only source by which insects attain considerable altitudes in the free atmosphere; it is possible to predict the altitudes attainable by analyzing the air mass characteristics and by generalizing with cloud types. As a means of lengthy horizontal transport, convection cannot be considered effective, though thunderstorms may act as a medium for rapid redistribution of numerous insects over a wide area. Use of various insect-feeding birds as indicators of zones or areas of insect abundance is described in connection with a discussion of the probable relative population density in and outside of convective currents.

IV. *Distributive processes of economic significance*.—In this final paper it is stated that the distribution of insects in the atmosphere by the wind occurs within the lower layers and may take place over a short or long range. Convection may carry insects to high altitudes, but distributes them over relatively short ranges at the surface. To establish a new insect colony of economic significance, a distributive process must combine lengthy duration with steadiness of direction. In this respect long-distance distribution by wind usually may be neglected, since it is an unsteady phenomenon, only occasionally delivering a few individuals of a given species to a suitable habitat. Short-range high- or low-altitude processes caused by local topography are of greatest economic significance; these are more or less fixed in direction and recurrent at short intervals. Thus they may be responsible for the infiltration of a species in a relatively short time. It should be possible for entomologists to utilize the presence of such weather factors in planning the control of pest species; it may or may not be necessary to call on local meteorologists for weather information.

Effect of pretreatment on the toxicity of insecticidal films on building surfaces. P. S. HEWLETT and E. A. PARKIN (*Nature [London]*, 155 (1945), No. 3947, pp. 755-756, illus. 1).—In the tests reported, oil films incorporating pyrethrins as the toxic agents were moderately toxic when deposited on wood (deal), of low toxicity on brick, and virtually nontoxic on limewash, concrete, and cement. In the search for ways to increase the toxicity and persistence of these films, size and gelatin applied in aqueous colloidal solution ahead of the insecticides have proved the most useful of the materials tested and at present available, gelatin at equal concentrations giving the more satisfactory results. A solution of pyrethrins was used in most of the laboratory work, but coatings of size or gelatin also supported solutions of other insecticides—including DDT—in an oil base.

Investigation of the insecticidal value of an extract from *Amorpha fruticosa*. S. A. MCCRORY. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc.*, 24 (1944), pp. 90-97).—Preliminary studies revealed that this plant contains some toxic principle other than rotenone; the material proved less stable than most organic insecticides. The seeds seem to contain more of the toxic substance than other parts of the plant and this species more than others of the genus growing in South Dakota. In the light of present information, however, *A. fruticosa* gives very little promise of furnishing a practical insecticide.

An amide possessing insecticidal properties from the roots of *Erigeron affinis* DC. F. ACREE, JR., M. JACOBSON, and H. L. HALLER. (U. S. D. A.). (*Jour. Organic Chem.*, 10 (1945), No. 3, pp. 236-242, illus. 1).—An isobutylamide of an unsaturated C_{20} acid was isolated from the roots of *E. affinis*. This amide—here named "affinin"—was found to have the same order of paralyzing action and toxicity to houseflies as the pyrethrins and also proved toxic to several other insect species tested. On hydrogenation the amide was converted to N-isobutylcapramide.

Constituents of the insecticidal resin of the yam bean (*Pachyrhizus erosus*). L. B. NORTON and R. HANSBERRY. (N. Y. State Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 9, pp. 1609-1614, illus. 1).—"The ether extract of yam beans was divided into a nontoxic oil and a resin toxic to insects. The resin was fractionated by chromatographic methods, yielding one noncrystalline and six crystalline compounds and three heterogeneous fractions. One of the crystalline compounds was identified as rotenone, and a second, designated 'erosone,' was shown to be closely related to elliptone. Four of the compounds showed evidence of a relation to the rotenoid structure, but differed in containing a single methoxyl group. Three of the compounds and one of the heterogeneous fractions were toxic to the silkworm, but two of these compounds were of low toxicity to the Mexican bean beetle. The toxic heterogeneous fraction probably contained at least one toxic compound not isolated."

The analysis of D. D. T. and pyrethrins in kerosene-based sprays. R. F. POWNING (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 2, pp. 121-123).—A method developed for separating and analyzing DDT and pyrethrins in a mixed insecticide spray is described.

Thermal stability of D. D. T. I. E. BALABAN and F. K. SUTCLIFFE (*Nature [London]*, 155 (1945), No. 3947, p. 755).—In the authors' experiments DDT—pure or of commercial quality—was decomposed only at relatively high temperatures, but metal salts, even in very small amounts, enhanced the onset of this decomposition.

Accumulation of DDT in the body fat and its appearance in the milk of dogs. G. WOODARD, R. R. OFNER, and C. M. MONTGOMERY (*Science*, 102 (1945), No. 2642, pp. 177-178).—The authors found that DDT in amounts of significance in its toxicological evaluation were stored in the body fat of dogs given daily oral doses, the storage increasing with the dosage level. Feeding oil solutions of DDT elicited greater accumulations in the fat than did feeding the undissolved material. The

accumulated DDT gradually disappeared from the fat after discontinuing its administration. The milk of lactating dogs receiving DDT or its orthopara isomer contained appreciable amounts of the respective compounds.

Caution urged as DDT available for civilian use, C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 8, p. 2).—A practical account.

The fourteenth or 1944 annual insect population summary of Kansas, G. A. DEAN, R. C. SMITH, and E. G. KELLY. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 18 (1945), No. 3, pp. 85-99, illus. 1).—This annual summary (E. S. R., 92, p. 238) gives a descriptive account of the more important insect activities and climatic relationships during 1944, as well as summaries of crop production and of weather conditions in the State by months.

Recherches sur le hanneton commun (Phyllophaga spp.) [Researches on the common May beetles (Phyllophaga spp.)], G. MAHEUX and G. GAUTHIER (*Min. Agr. Prov. Québec Mem.* 1 (1944), Ser. 1, pp. 69+, illus. 50).—A general study, including résumés on the taxonomy, history, geographical distribution, life history, and economic importance and a review of previous studies (82 references); the material and methods of the present study, bioecological observations on the adults, eggs, larvae, and pupae; and control methods applicable at the different life history stages.

Siphonaptera: A new species of Conorhinopsylla from Kansas, W. L. JELLISON (*Jour. Kans. Ent. Soc.*, 18 (1945), No. 3, pp. 109-111, illus. 1).—*C. nidicolus* n. sp., a species of flea collected from nests of wood rats, is described.

The Nearctic species of Tendipedini (Diptera: Tendipedidae (= Chironomidae)), H. K. TOWNES, JR. (U. S. D. A.). (*Amer. Midland Nat.*, 34 (1945), No. 1, pp. 1-206, illus. 261).—This constitutes a taxonomic treatment of the adult midges of the tribe Tendipedini occurring in the United States, Canada, Alaska, and Greenland; they comprise most of the larger and commoner species of the family Tendipedidae.

Cephenemyia jellisoni Townsend (Diptera: Cuterebridae) reared from nasal bot of blacktailed deer, C. M. HERMAN (*Pan-Pacific Ent.*, 21 (1945), No. 3, p. 120).—The author reports this as the second instance of the rearing of this fly in captivity.

Undescribed species of Tipulidae from the western United States (Diptera), II, C. P. ALEXANDER. (Mass. State Col.). (*Pan-Pacific Ent.*, 21 (1945), No. 3, pp. 91-97).—Five new species of crane flies are described (E. S. R., 92, p. 243).

Hyalopteroides pallida Theobald, an aphid new to North America (Hemiptera: Aphididae), E. O. ESSIG. (Univ. Calif.). (*Pan-Pacific Ent.*, 21 (1945), No. 3, pp. 119-120).—This little-known aphid was collected on orchard grass in a greenhouse at Corvallis, Oreg.

An annotated check list of the mealy bugs and scale insects of Fiji, R. J. A. W. LEVER (*Agr. Jour. [Fiji]*, 16 (1945), No. 2, pp. 41-44).

Some new species of Cloanthanus (Homoptera: Cicadellidae) from the eastern United States, D. M. DELONG. (Ohio State Univ.). (*Ohio Jour. Sci.*, 45 (1945), No. 1, pp. 22-28, illus. 2).—Nine new species in this leafhopper genus are described.

Relative efficiencies of nicotine sulphate and certain arsenates for control of diamond-back moth, W. COTTIER and H. JACKS (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 1, Sect. A, pp. 37-39).—Nicotine sulfate at 1 part by volume to 200-400 parts water proved superior to lead and calcium arsenates applied at 2, 3, and 4 lb. per 100 gal. water. All concentrations of calcium arsenate injured the cabbage plants, as did also the 4-lb. concentration of lead arsenate.

The gypsy moth in Connecticut, R. B. FRIENN. (Conn. [New Haven] Expt. Sta.). (*Conn. Acad. Arts and Sci. Trans.*, 36 (1945), pp. 607-629).—The author

summarizes the gypsy moth problem in the State, including a review of earlier work (32 references), the life cycle and habits of the pest, its injuriousness, the effects of climate, its host plants and natural enemies, artificial control measures, and a general statement on the problem in Connecticut.

Notes on the habits of the predator *Cymatodera ovipennis* Say with a description of the pupa (Coleoptera: Cleridae), J. W. MACSWAIN. (Univ. Calif.). (*Pan-Pacific Ent.*, 21 (1945), No. 3, pp. 97-100, illus. 1).

Further notes on some species of *Pleocoma* (Coleoptera: Scarabaeidae), E. G. LINSLEY. (Univ. Calif.). (*Pan-Pacific Ent.*, 21 (1945), No. 3, pp. 110-114).—Miscellaneous notes, with one new species described.

A new species of Chyphotes from California (Hymenoptera: Mutillidae), R. M. SCHUSTER. (Cornell Univ.). (*Pan-Pacific Ent.*, 21 (1945), No. 3, pp. 89-90).

Notes on *Ammoplanus* (Hymenoptera: Sphecidae: Pemphredonini), V. S. L. PATE. (Cornell Univ.). (*Pan-Pacific Ent.*, 21 (1945), No. 3, pp. 81-88, illus. 3).—Includes descriptions of two new Nearctic species of this thripotherous genus.

Bacterial and nematode parasites of soil insects, L. J. DUMBLETON (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 1, Sect. A, pp. 76-81).—The author reports a native bacillus causing a milky disease of *Odontia zealandica*, and on the introduction of *Bacillus popillae* and the nematode *Neoplectana glaseri*; the possible importance of these two organisms for controlling pasture pests in New Zealand is discussed.

Sobre algunas especies de cicádidos presentes en nuestro país y citadas como perjudiciales a la agricultura [Some species of cicadas present in Argentina which are prejudicial to agriculture], B. A. TORRES (*Argentina Min. Agr., Inst. Sanidad Veg.*, 1 (1945), No. 4, Ser. A, pp. 10, illus. 11).—Six species are considered, including their geographical distribution in Argentina.

Presence of reddish pigment in eggs and ovarioles of the desert locust and its probable phase significance, M. L. ROONWAL (*Nature [London]*, 156 (1945), No. 3949, p. 19).—A preliminary note on *Schistocerca gregaria* (Forskål).

The international locust control, H. J. BREDO (*East African Agr. Jour.*, 11 (1945), No. 1, pp. 12-16, illus. 3).—A general historical account and summary of modern methods of international cooperative control, with the factual bases on which they rest.

Wireworm populations in relation to crop production.—I, A large-scale flotation method for extracting wireworms from soil samples and results from a survey of 600 fields, G. F. COCKBILL, V. E. HENDERSON, D. M. ROSS, and J. H. STAPLEY (*Ann. Appl. Biol.*, 32 (1945), No. 2, pp. 148-163, illus. 4).—A survey in the eastern counties of England revealed many cases where the observed wireworm damage failed to correspond with the estimated field populations. Tests revealed that picking the wireworms out of soil samples by hand recovered extremely variable proportions of larvae in the samples and that an average of only two-fifths of them were obtained. A modified form of the washing and flotation technic of Salt and Hollick (*E. S. R.*, 91, p. 715) was introduced for large-scale work and is here described. By this method, 10 samples of soil (4 in. diameter and 6 in. deep) bulked together are examined at a time and can be dealt with at the rate of 13 samples per man per hour with an efficiency of 95-100 percent accuracy. The populations estimated on 600 fields (December 1942-May 1943) have thrown more light on the size and composition of the wireworm population in grass and arable fields. Inspection of the crop results on fields tested by the washing process indicated a much closer relationship between the wireworm populations and their damage than had been obtained by the hand-sorting method in the preceding year.

False wireworm, which causes damage to small grains, can be easily controlled, C. R. JONES (*Colo. Farm Bul. [Colorado Sta.]*, 6 (1944), No. 6, pp. 13-15, illus. 1).—Larvae attack wheat soon after planting in the fall and destroy the kernel before germination, with injury more pronounced in dry years. Crops growing on land which has been continuously cropped to wheat are usually more severely injured than those on land rotated with a row crop. Both clean cultivation and summer fallow produce conditions nonfavorable for this insect. Late planted wheat is less severely damaged than that planted early. Poison baits containing arsenicals are also recommended for controlling this insect.

Biological notes on *Pleocomma hirticollis vandykei* Linsley (Coleoptera: Scarabaeidae), R. F. SMITH and R. W. L. PORTS. (Univ. Calif.). (*Pan-Pacific Ent.*, 21 (1945), No. 3, pp. 115-118).—It is believed evident from the authors' observations that this beetle is a pasture land form. A rain of about 0.5 in. appears necessary to release the ♂♂ in the fall; they emerge before the ♀♀ and search out their burrows, entering the ♀ tunnel to copulate. After this the ♀ plugs her burrow and passes downward. The ♂♂ spend the nights in small burrows which they dig each night. The life cycle apparently takes at least 2 to 3 yr., the larvae feeding perhaps generally on the roots of the pasture-grassland plants.

Corn borers, D. A. WILBUR. (Kans. State Col.). (*Kans. State Bd. Agr. Rpt.*, 64 (1945), No. 266, pp. 97-111, illus. 8).—An address summarizing the history and research—with special reference to Kansas—on the southwestern corn borer and the European corn borer, including their control. Brief notes are added on other insects that tunnel into cornstalks.

Larva de microlepidoptero que ataca al lino, *Eulia loxonephes* Meyr. (Tortricidae) [Larva of a microlepidopteran attacking flax—*E. loxonephes* (Tortricidae)], A. C. DE GAHAN (*Argentina Min. Agr., Inst. Sanidad Veg.*, 1 (1945), No. 2, Ser. A, pp. 9+, illus. 9).—A report on the larval stages of this tortricid moth and the damage which it does to flax.

Colorado beetle in England during the war (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 52 (1945), No. 5, pp. 210-215).—An account of the "invasions" of England by the Colorado potato beetle since the outbreak of the war and of the steps taken by the Ministry of Agriculture to deal with them.

Effects of DDT and other insecticides on several species of potato insects, R. E. HILL (*Nebraska Sta. Res. Bul.* 138 (1945), pp. 14).—In both field and laboratory tests DDT proved more effective than any other material against potato insects. Tests were conducted with tuber flea beetles, potato psyllids, potato leafhoppers, green peach aphids, *Lygus elisus*, *Chlamydatus associatus*, *Aceratagallia uhleri*, and six-spotted leafhoppers. The material remained effective against psyllids and leafhoppers under field conditions for a relatively long period. Populations of some beneficial insects were reduced. No injurious influence on plants was noted.

Physiological effect of DDT upon potato plants, R. L. WALP (*Gray Mem. Bot. Assoc. Bul.*, 11 (1945), No. 4, pp. 6-7, illus. 1).—One season's findings appeared to indicate that the yield of leaves is larger, the leaves are more flexible, and there is a greater amount of chlorophyll in plants sprayed with DDT.

Starvation of the early instars of the pale western cutworm (*Agrotis orthogonia* Morr.) and its use in the control of this pest, H. L. SEAMANS and P. J. G. ROCK (*Canad. Ent.*, 77 (1945), No. 4, pp. 57-61).—This insect is said to have been a serious pest of wheat on the Canadian prairies since 1911. Repeated observations and field history studies had revealed effective control by some combination of factors—cultural or otherwise. Attempts to starve the larvae indicated that those newly hatched will live for several weeks in the field without food; after the second instar the length of time larvae of all ages can go without food is roughly proportional to their size and age. Recent tests have demonstrated that the newly hatched

larvae can live without food for varying periods, depending on the temperature, but that after feeding has once started, removal of food results in starvation; the length of time the first-instar larvae can exist without food is longer at the lower temperatures in either case. First- and second-instar larvae feed largely on plant parts above the soil surface, and feeding begins as soon as green vegetation appears. Starvation control was considered possible by waiting for weed and volunteer growth to get started and then destroying it. This method was first tried in the greenhouse (1935-36); the results indicated that seeding a crop as soon as the cultivation was done failed to give satisfactory control, but that if delayed a few days the larvae were reduced in numbers and no damage to the succeeding crop followed. Field tests (1936) corroborated these findings and showed that seeding should be delayed over 6 but less than 11 days for complete control. Extensive field demonstrations (1937-38) and a study of field history records of the preceding 15 yr. have further corroborated previous results. The "starvation" control method is shown to be practical for both large and small fields. It does not delay the seeding of the crop sufficiently to endanger the quality or quantity of grain secured, and it provides for excellent weed control.

The wheat midge in the Pacific Northwest, M. M. REEHER (*U. S. Dept. Agr. Cir. 732 (1945), pp. 8*).—Observations on the wheat midge were carried on near Lynden, Wash., during the period 1921-24. Surveys were made every 2 or 3 yr. thereafter through 1941. In 40 yr. the midge has spread from the Chilliwack district in Canada 180 mi. south to Puyallup and Orting in Washington. Damage to the grain is caused by the larvae feeding on the developing kernels. Larvae feed on the kernels of wheat, barley, and rye, and they reach maturity in about 2 weeks. The winter is passed as larvae in cocoons in the soil. Adult flies emerge in late June and early July and oviposit on the grain heads emerging from the boot through blossoming. Most of the day is spent at the base of the grain stalks, as oviposition takes place only in late afternoon and evening. Eggs are laid in clusters in grooves on the spikelets and under the glumes. They hatch in 5 to 7 days. The mite, *Atomus pilosus* Banks, was found destroying midge eggs, and a small hymenopteron, *Inostemma horni* Ashm., was observed ovipositing in eggs of the midge. Fall-sown wheat was not injured and spring wheat, seeded by the first week in April, usually escaped serious injury. Seeding of fall or winter wheat on peat land should be avoided, however. Infested stubble fields should be plowed under before the overwintering midges emerge in June. Sowings of spring wheat should be located as far as possible from unplowed wheat stubble of the previous year.

Experiments on the control of cabbage pests in North Queensland, T. GREGG (*Jour. Council Sci. and Indus. Res. [Austral.], 18 (1945), No. 2, pp. 110-120*).—The results of field tests on an early and a late crop are reported. The first was attacked by larvae of *Prodenia litura* F., *Crociodolomia binotalis* Zell., the corn earworm, and the cabbage webworm; the late crop, by larvae of the diamondback moth and green peach aphid. In the first test, dusts containing DDT, lead arsenate, calcium arsenate, and cryolite all gave good control with four applications at 10-day intervals; magnesite, derris, and magnesite plus nicotine were less satisfactory. In the second test, DDT dusts were better than all other treatments against the diamondback moth and green peach aphid; against the latter, magnesite plus nicotine was superior to four timbo dusts containing 0.5 percent rotenone and these in turn were better than cryolite; all other treatments were inferior. Owing to the enormous aphid population on the late crop, dusts without aphicidal effect were removed from the plants by the movements of the aphids; in this way the larvae of the diamondback moth were protected from the dusts. Derris and timbo dusts containing 0.5 percent rotenone and timbo containing 1 percent rotenone proved ineffective against *P. litura* and the corn earworm. The combined results indicated that when used to dilute

lead and calcium arsenates, the order of effectiveness of the diluents was pyrophyllite, kaolin, and hydrated lime.

The European corn borer in market garden sweet corn, C. R. NEISWANDER. (Ohio Expt. Sta.). (*Ohio. Veg. and Potato Growers Assoc. Proc.*, 30 (1945), pp. 35-45, illus. 3).—During the first 15 yr. that this borer has occurred in Ohio its developmental history is said to have been fairly constant, breeding only in corn and with one brood a year. In recent years, however, infestations have been found in potatoes, oats, and various ornamental plants and weeds, though corn still remains the preferred host; the pest now also has two broods a year, though many individuals still maintain their single-brood habit. These changes in behavior are important to corn growers, since it has been found that infestation in any one field depends in a measure on the stage of the crop at time of oviposition; in general, the tallest corn receives the most eggs. A reduction in egg deposition, however, was not the only advantage found from delay in planting; the reduction in borer population in late plantings, irrespective of egg deposition records, was correlated with plant development as measured by date of silking, i. e., a higher survival of borers occurred on the plants nearest to maturity at the time the larvae were becoming established. Recommended planting dates for different parts of Ohio are presented on the basis of these findings. No variety or hybrid of sweet corn is known to be highly resistant, but it is believed that eventually such lines will be developed. Growers desiring corn for the earliest market in localities where borers have been numerous are advised to use insecticides.

Phenothiazine in codling moth control, J. MARSHALL (*Sci. Agr.*, 25 (1945), No. 9, pp. 546-550).—Experiments with phenothiazine against codling moth were carried out in British Columbia during 1937-44. The material used during 1937-41 had about the same effect as lead arsenate; when micronized, however, and used with a small quantity of "stove oil," phenothiazine pound-for-pound was about four times as effective. It evidently favored the development of the European red mite and the Pacific mite. Should phenothiazine become available at a reasonable price it might aid in eliminating lead arsenate from the local spray schedule for apples; it is believed preferable to use it in early cover sprays rather than in later applications.

Using the new methods for peach borer control, O. I. SNAPP. (U. S. D. A.). (*Nebr. State Bd. Agr. Ann. Rpt.*, 1944, pp. 327-335).—Information is presented on preparing and applying ethylene dichloride emulsion as based on some 8 yr. of research, with comments on possible injury from its improper use. Injury to peach trees in the Eastern States which had been attributed to it was found due chiefly to winter injury; in 6 only of the 50 orchards examined did there seem to be a possibility of injury from this material, and in these orchards it had in one way or another been improperly mixed or applied.

Use of DDT for cranberry girdler *Crambus hortuellus* Hbn., C. A. DOEHLERT. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg.*, 75 (1945), pp. 22-23).—Dusting before bloom and spraying after bloom (to minimize the danger to bees) gave "evidence that it is theoretically possible to kill girdle worm [*C. hortuellus*] with such" treatments.

Control of pests of shrubbery and flowers, C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 6, pp. 1, 2, 8).—A practical account.

Notas sobre "Xanthopastis timais" (Cram.) (Lep.: Noct.) praga das amarilidáceas [Notes on *X. timais*, a pest of the Amaryllidaceae], E. R. DE FIGUEIREDO, JR., and H. F. PEREIRA (*Arq. Inst. Biol. [São Paulo]*, 15 (1944), pp. 289-298, illus. 15; *Eng. abs.*, p. 298).—The authors present observations on the biology of this noctuid pest of *Amaryllis* spp. and other ornamentals of the family, with a suggested method of control by a spray containing arsenate of lead.

The black vine weevil (*Brachyrhinus sulcatus*), P. H. BRYDON (In *Rhododendron Yearbook, 1945. Portland, Oreg.: Amer. Rhododendron Soc., 1945, pp. 88-91*).—A brief note on the damage to rhododendrons by this pest, with suggestions for its control.

Use of shoot characters in selecting ponderosa pines resistant to resin midge, L. AUSTIN, J. S. YULL, and K. G. BRECHEN. (U. S. D. A.). (*Ecology, 26 (1945), No. 3, pp. 288-296, illus. 4*).—The resin midge (*Retinodiplosis* sp.), a small fly, oviposits on twigs of young ponderosa pine. The larvae feed beneath the epidermis, retarding growth, causing deformities, or even killing some trees. This report describes an experimental survey of damage to a young plantation, infestation and damage being rated when the 1,100 trees—representing several geographic races—were 10 yr. old and again 2 yr. later. It was thus learned that trees with new shoots that were glaucous (covered with a waxy bloom) or glabrous (dry and smooth) were injured little if any, while those having shoots that were viscid (sticky with resin) suffered most. Correlations are presented. It is suggested that trees susceptible to resin midge attack might be quickly selected for removal from the stand by observing the surfaces of their shoots.

DDT used to control spread of forest-insect epidemics. (U. S. D. A. et al.). (*Jour. Forestry, 43 (1945), No. 7, pp. 519-520*).—A note.

Line cribs and fumigate corn for weevil control, A. L. HAMNER (*Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 7, p. 7*).—A practical account.

The control of insect pests in Victorian bulk wheat depots, F. WILSON (*Jour. Council Sci. and Indus. Res. [Austral.], 18 (1945), No. 2, pp. 103-109*).—Grain in Victorian bulk-wheat depots is subject to infestation by many of the common grain pests; among them the lesser grain borer is of outstanding importance. Infestation is very largely restricted to a thin layer of wheat about a foot deep at the surface of the mound; as the infestation may spread over the whole surface, however, considerable damage may result unless controlled. By applying finely divided magnesite or dolomite to the surface of the wheat the number of infestations can be greatly reduced. Good control of infestations developing despite the dust barrier has been obtained by local surface fumigation with CS₂ or ethylene dichloride.

Control of household pests, C. LYLE (*Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 6, p. 7*).—A practical account.

Treatment for fleas and ticks on pets and around homes, C. LYLE (*Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 8, p. 8*).—A practical account.

Field investigations pertinent to Bullis fever: The lone star tick (*Amblyomma americanum* (Linnaeus, 1758))—notes and observations from Camp Bullis, Texas, J. M. BRENNAN (*Tex. Rpts. Biol. and Med., 3 (1945), No. 2, pp. 204-226, illus. 3*).—This tick—a consequential pest—is receiving increased recognition in medical entomology as a disease vector; more recently it has been associated with the transmission of a new rickettsial disease entity, Bullis fever. The tick was found to be exceptionally abundant at Camp Bullis, where it was shown to have a wide range of hosts. The unfed ticks occurred in focalized distribution throughout the military reservation. Methods for collecting and shipping large numbers for experimental purposes are described. Observations on the seasonal trend of the tick population revealed activity beginning in February and reaching a peak in May or June; there was little or no activity during October-January. Tick-host data for June-September (1943) are tabulated. Deer are shown to be the dominant hosts for the adults. Deer, rabbits, foxes, raccoons, skunks, and birds frequenting thicket and ground are the principal hosts for the immature stages of the tick; the smaller rodents proved to be relatively unimportant. Observations are recorded on the habits and behavior of this tick. There are 17 references.

Studies on the control of the Nuche fly and cattle tick, R. L. SQUIBB (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 291-296).—*Dermatobia hominis* (L., Jr.) and *Boophilus microplus* (Canestrina, 1887; Dönitz, 1907) are said to be the two most destructive parasites of livestock in Latin America; preliminary tests against them with DDT and rotenone are reported. Best results in Nuche fly control were obtained with a double spray of 4 percent DDT powder in kerosene and a rotenone water solution made by using green crushed derris roots; cattle ticks were likewise destroyed after two applications of these solutions a week apart. The rotenone also showed healing properties. Observations indicated some seasonal differences as to the rate of infestation by the Nuche fly; a negative relationship between the number of larvae in the animal and a period of constant rainfall was also found. A single spray solution of DDT and rotenone developed and tested was found effective against the tick with one application and showed promise against the Nuche fly. No visible toxicity of this solution to animals has thus far been encountered, but extreme caution is advised until the effects have been fully worked out. Spraying and bathing animals cannot be depended on alone to effect complete control of these pests; certain supplemental and necessary management practices are also suggested.

Histological effects of veratrine on the housefly, H. I. WECHSLER (*Diss., Fordham Univ., New York*, 1944, pp. 13-15).—An abstract of a doctor's dissertation.

Nota sobre a infestação de *Musca domestica* Linneu, 1758, por um ficomiceto do gênero *Empusa* [Note on the infestation of the housefly with a fungus of the genus *Empusa*], J. F. DE SALLES and C. R. HATHAWAY (*Mem. Inst. Oswaldo Cruz*, 41 (1944), No. 1, pp. 95-99, illus. 4; *Eng. abs.*, p. 90).—Biological and histological data from the study are presented.

The need for a mosquito survey in South Dakota, H. C. SEVERIN. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc.*, 24 (1944), pp. 54-60).—A brief review of published material (7 references) on the mosquitoes of the State and general discussion of the need for further surveys and studies.

Check list of Fiji mosquitoes with further notes on a newly described species, R. J. A. W. LEVER (*Agr. Jour. [Fiji]*, 16 (1945), No. 2, pp. 47-48).

Marking *Anopheles* mosquitoes with fluorescent compounds, J. W. ZUKEL (*Science*, 102 (1945), No. 2641, p. 156).—The method presented involves the application of fluorescent compounds as aerosols or dust for marking adults of the common malaria mosquito and later detecting those marked under an ultraviolet light.

Second report on the control of *Anopheles quadrimaculatus* Say in the water-chestnut areas of the Potomac River, 1944, M. M. PRICE and F. E. LYMAN (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 34, pp. 985-994, illus. 2).—In this report (E. S. R., 91, p. 722) the authors discuss the control of the common malaria mosquito by airplane dusting with paris green and by cutting the water chestnuts in the Potomac River. Cutting had eliminated the necessity for airplane dusting in the vicinity of four of the six military establishments protected by this method in 1943; in 1944, dusting was necessary only at Fort Belvoir and Quantico Marine Barracks, Va., where breeding of this mosquito in uncut water chestnut areas and swamps still occurred. Records indicated the successful control of the mosquito throughout the 1944 breeding season.

Tests of the effectiveness of DDT in anopheline control, S. W. SIMMONS (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 32, pp. 917-927, illus. 3).—The average tenant house was treated with a DDT residual spray at a cost of about \$1.50 to \$1.75 exclusive of initial outlay for heavy equipment. Application can be made either by a hand-pressure sprayer or with a power machine, and at a dosage of 200 mg. DDT per square foot of surface area has effected a 60 to 90 percent mortality of wild mosquitoes in unoccupied houses 20 weeks after treatment. A residual toxicity of this duration suggests that one treatment per year might suffice in the more northern

malaria zones of the United States; two treatments will probably be required, however, in the southern areas. Residual sprays give a less effective kill in occupied houses because of the large proportion of untreated resting places; treatment of household effects is thus advised where practical. Treated wooden surfaces exposed to 14 in. of rainfall over a 4-week period gave a 25 percent kill as compared with 75 percent for controls; sunlight alone caused a reduction in toxicity of 10 percent over the same period. Apparatus and methods for a critical bioassay of the lethal effectiveness of treated surfaces in laboratory and field are described and illustrated. DDT applied as a spray at 0.1 lb. per acre gave an essentially 100 percent kill of larvae. According to the solvent and spreading or emulsifying agent employed, applications may be made as surface-film treatments, stable emulsions, or suspensions. No appreciable residual toxicity to larvae was observed. Laboratory tests indicated that bottom mud inactivates the DDT; distribution of the DDT-laden mud throughout the water failed to restore the toxicity, suggesting that DDT actually combines with or adheres to components of the mud. Materials for effective larvicidal treatment with DDT are said to cost less than one-fifth as much as a comparable effective application of fuel oil.

The language of the honeybees, M. H. HAYDAK. (Minn. Expt. Sta.). (*Amer. Bee Jour.*, 85 (1945), No. 9, pp. 316-317).—"This brief article brings together all the known facts about the ways in which honeybees communicate with each other. The author entertains the hope that it will be helpful to persons interested in interpreting some of the activities of bees."

The behaviour of bees when foraging, C. G. BUTLER (*Jour. Roy. Soc. Arts*, 93 (1945), No. 4690, pp. 501-511)—An address, presenting a general account, with discussion.

Food reserves for bees, C. L. FARRAR. (U. S. D. A. coop. Univ. Wis.). (*Amer. Bee Jour.*, 85 (1945), No. 9, pp. 313-315, 323, illus. 3).—The author discusses honey and pollen reserves and soybean flour as a pollen supplement and presents practical recommendations.

ANIMAL PRODUCTION

Bipenergetics and growth, with special reference to the efficiency complex in domestic animals, S. BRODY (*New York: Reinhold Pub. Corp.*, 1945, pp. 1023+, illus. 384).—In this comprehensive treatise, comparative studies are reported on the energetic efficiencies of agricultural processes, such as those concerned in the production of meat, milk, eggs, and muscular work, along with the factors influencing these efficiencies. The book deals especially with the work of the author and associates at the Missouri Experiment Station as reported in about 60 research bulletins on growth and development, and is arranged under the following chapter headings: Introduction—factors in the efficiency complex; energetics, energy units, and dietary-energy categories; energetic efficiencies of growth and work processes; specific dynamic action and efficiency of productive processes; plane of nutrition, the principle of diminishing increments, and efficiency; metabolic catalysts in the efficiency complex—enzymes, minerals, and vitamins in biologic oxidations; metabolic catalysts in the efficiency complex—hormones; metabolic catalysts in the efficiency complex—seasonal rhythms; metabolic catalysts in the efficiency complex—diurnal rhythms; homeostasis and organismic theory; homeothermy, temperature in life processes, and productive efficiency; methods in animal calorimetry; basal energy and protein metabolism in relation to body weight in mature animals of different species; metabolism and pulmonary ventilation in relation to body weight during growth; maintenance needs in relation to basal metabolism, body size, and productive efficiency; time relations of growth of individuals and populations; linear growth, form, and

function; aging in relation to growth and efficiency with special reference to milk and egg production; physiologic time and equivalence of age; nutritional aspects in the efficiency complex; milk—nutritional, social, and physiological aspects; the monetary economy of milk production; egg production—nutritional and energetic efficiency aspects; energetic efficiency of muscular work and indices of work-reserve capacity; and summary and integrating discussion. The world literature in the field has been fully drawn on, and an extensive list of references is included.

Nutritive evaluation of defluorinated phosphates and other phosphorus supplements, II, III (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 1, pp. 118-142).—Part I of this series is noted on page 2.

II. *Defluorinated phosphates as phosphorus supplements for chicks*, H. R. Bird, J. P. Mattingly, H. W. Titus, J. C. Hammon, W. L. Kellogg, T. B. Clark, C. E. Weakley, Jr., and A. H. Van Landingham (pp. 118-129) (Md. and W. Va. Expt. Stas. and U. S. D. A.).—The effectiveness of 10 different samples of phosphate materials as sources of phosphorus for bone formation of chicks during growth was investigated at the above experiment stations and the U. S. D. A., Agricultural Research Center. The phosphorus sources included 6 of defluorinated superphosphate and 1 each of defluorinated phosphate rock, phosphate slag, calcium pyrophosphate (β), and vitreous calcium metaphosphate. Judged by the effect on bone ash, 1 sample of defluorinated superphosphate was almost completely unavailable, and its availability was not increased by finer grinding. The phosphate in the other 5 samples was available, but less so than in bone meal and tricalcium phosphate. The availability of the phosphorus in defluorinated phosphate rock, phosphate slag, and vitreous calcium metaphosphate was intermediate between the phosphate in the superphosphates on the one hand and bone meal and tricalcium phosphate on the other. Calcium pyrophosphate was totally unavailable or nearly so. The solubility in 0.25 percent HCl at 38° C. was found to be a quick approximate measure of the phosphate availability. Each of the supplements fed in one experiment of 8 weeks' duration seemed to have a detrimental effect on growth when fed at levels equivalent in phosphorus content to 2 percent bone meal. Metaphosphate had a detrimental effect on growth at a phosphate level equivalent to 1 percent bone meal. The availability of the phosphate was ascertained with chicks at levels of about 0, 0.5, 1, 1.5, 2, and 3 percent with live weight of the chicks at 4 and 8 weeks. About 15 and 25 chicks per lot were included in the studies of the defluorinated phosphate products at the different laboratories.

III. *Utilization experiments with rats*, N. R. Ellis, C. A. Cabell, W. P. Elmslie, G. S. Fraps, P. H. Phillips, and D. E. Williams (pp. 129-142) (U. S. D. A., Tex. and Wis. Expt. Stas., Univ. Tenn., et al.).—The availability of calcium and phosphorus in commercially and experimentally defluorinated phosphates for bone formation in the rat was estimated by the above experiment stations, the U. S. D. A. Bureau of Animal Industry, and a commercial laboratory. Young rats were fed for short periods on basal rations low in phosphorus and calcium to which graded amounts of the test materials were added. The test materials were evaluated by growth, blood phosphorus level, phosphorus retention, and bone ash in 4 to 6 rats per group in 28-day feeding experiments.

The different test materials showed the comparative effects of the different supplements, and provided evidence of the effects of ferric and aluminum phosphates and temperatures of defluorination of superphosphate on arbitrary grades of availability of the calcium and phosphorus in these products. The composite findings show that defluorinated phosphate rock prepared by the fusion process compared favorably with bone meal or calcium phosphate as a calcium and phosphorus carrier. One phosphate slag was rated in availability as good and another as fair. The availability of different kinds of commercially defluorinated super-

phosphate ranged from reasonably good to poor. The form in which calcium phosphate exists determines its availability. Calcium metaphosphate of the β form, β -pyrophosphate, and, to a less extent, γ -pyrophosphate are relatively unavailable, but both the α - and β -ortho forms of tricalcium phosphate are highly available. Vitreous calcium metaphosphate is intermediate. Calcination at 1,010° C. produced a defluorinated superphosphate more available in calcium and phosphorus than that calcinated at lower temperatures. There was good correlation between solubility in dilute hydrochloric acid and citric acid and the availability ratings for the individual products.

Mineral deficiencies in animals (*Vet Med.*, 40 (1945), No. 9, pp. 312-314, illus. 2).—A brief review of deficiencies of calcium, cobalt, copper, iodine, magnesium, chlorine, and phosphorus.

Ineffectiveness of vitamin E in preventing cholesterol deposition in the aorta, H. DAM (*Jour. Nutr.*, 28 (1944), No. 4, pp. 289-295).—Study was made of whether the presence or absence of vitamin E might not influence the deposition of cholesterol in the aorta of rabbits and chicks. Vitamin E fed as 10 mg. percent *d*, *l*- α -tocopherol acetate failed to modify the deposition of cholesterol in the aorta of rabbits fed a ration of ground oats and carrots with 1 percent cholesterol and in chicks fed a ration deficient in vitamin E and containing 30 percent lard and 2 percent cholesterol with and without the addition of 1.5 percent inositol or 2 percent lipocaic. The vitamin E supplement prevented a heavy mortality in rabbits and reduced the cholesterol content of the muscle in chicks on a normal ration and increased the muscle cholesterol content in chicks fed the same ration supplemented with 2 percent cholesterol, the effects of which are not explained. Additions of inositol in chick rations reduced, and lipocaic feeding increased, the extensive deposition of liver cholesterol following additions of the latter to the basal ration. The chick experiments were conducted with groups of about 10 birds each, with and without vitamin E and with vitamin E and inositol or lipocaic, and the content of cholesterol in the aorta and other organs was ascertained during the first 61 days of life.

Effect of storage on the feed value of hard red spring wheat, J. H. LONGWELL (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 6, pp. 3-5).—The top center, center below top, and bottom wheats from bins filled in 1940 were examined in 1944 and fed from June 15 to July 28 to groups of ten 115-lb. pigs each with protein supplements of meat and bone meal, soybean meal, and alfalfa meal. Although chemical analysis showed differences in the moisture, test weight, total nitrogen, and germination of the grain, the average daily gains of the pigs in the three lots were 1.40, 1.42, and 1.46 lb. A fourth lot self-fed the three wheats with the supplement made an average daily gain of 1.86 lb. and no cases of necrotic enteritis developed, although several pigs in each of the three individually fed lots became infected and two in each lot died.

Wood yeast protein as a feed for livestock, E. G. RITZMAN (*New Hampshire Sta. Tech. Bul.* 88 (1945), pp. 16).—Studies were made of the digestibility of wood yeast for dairy cows, the maximum amount that can be safely fed, and the degree to which such absorbed protein can be utilized for milk production or to promote growth. Two dry farrow cows each received daily for 26 days 4.4 lb. of yeast mixed with an equal amount of beet pulp. There were no abnormal effects from the yeast ration in the blood uric acid, blood sugar, cholesterol in the blood plasma, specific gravity of the urine, or the available protein or energy in the yeast fed during periods of 18 days following 7 days' adjustment. Evidently this amount of yeast protein could be fed to cattle as safely with regard to its effect on the kidneys as other common feedstuffs.

Three digestion trials of 18 days each were carried out, one with beet pulp alone and the other two with mixtures of beet pulp and yeast. Data are given on the

daily weights of the cows, food and water intake, feces and urine voided, pulse rate, rectal and stall temperatures, and barometric pressure at daily intervals. The yeast, which was produced from a culture of *Saccharomyces cerevisiae* race 12 grown on sulfite liquor, was found not only to have an exceptionally high protein content but to excel in digestibility all protein feeds except those of animal origin. It was calculated in different experiments that the yeast furnished 3,615 and 3,649 calories of metabolizable energy per kilogram of digestible dry matter.

Seasonal and geographic distribution of vitamin A deficiency in cattle, J. W. PATTON (*Vet. Med.*, 40 (1945), No. 9, pp. 304-308).—Reference is also made to ketosis and acetonemia, both of which may result from vitamin A deficiency.

Cottonseed meal or cake for finishing beef calves, R. H. MEANS (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 6, p. 2).—Neither cottonseed meal, cottonseed meal pellets, nor cottonseed cake, when fed as the only concentrated calf-fattening rations, produced satisfactory results, but 8 lb. of either of these feeds per day plus corn fed ad libitum produced satisfactory gains and profitable returns in a 141-day test with lots of 11 or 12 calves. The average daily gains were about 2 lb. per day with corn, alfalfa hay, and silage, but only 1.69 and 1.84 lb. when the cottonseed products were the sole concentrates.

Soybean meal increased gains in cattle wintering, grazing, and fattening tests, W. E. CONNELL and R. C. TOM (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 3, pp. 5-8, illus. 2).—Results are reported for the second year of an experiment in which four lots of steer calves were wintered, comparing cane silage with cane fodder and testing the value of adding soybean meal.

Northwestern, southwestern, and Corriedale-native ewes for wool and spring lamb production, R. H. MEANS (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 8, pp. 1, 2).—Continuing studies previously noted (*E. S. R.*, 91, p. 729), the highest returns in 1945 were from ewes of one-fourth Hampshire and three-fourths Merino breeding. The ewes of Corriedale \times native breeding ranked second. Returns per ewe for wool and lambs for Hampshire \times Merino crossbred ewes were slightly less.

Evaluating fleece quality of Navajo sheep from small samples, J. O. GRANDSTAFF and C. T. BLUNN. (U. S. D. A. et al.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 5, pp. 183-192, illus. 1).—Wool samples taken from 44 positions on each of 24 ewe and ram Navajo lambs at the Southwestern Range and Sheep Breeding Laboratory were measured and statistically analyzed. The amount of kemp varied independently of the amount of outer coat and other medullated fibers, whereas variations in the amount of outer-coat and medullated fibers other than kemp were closely associated. The significant factors established by an analysis of variance were: "(1) Within fleece regions the differences between sheep were the major source of variance in all but one instance; (2) the variance between fleece regions was many times as large as the variance within regions; (3) when the 24 sheep were considered as a unit, a sample of 100 fibers proved to be as reliable as 1,000 fibers for detecting significant differences between sheep; (4) the variance within positions, based on samples of 100 fibers, was significantly greater than the variance between positions, except for the belly region." The thigh region was highest for kemp and the side highest for other medullated and outer-coat fibers. All multiple correlations between the average of 2, 3, and 6 positions and of the other 38 were significant or highly significant. Combinations of 3 and of 6 positions proved to be slightly superior to the combination of side and thigh for evaluating outer-coat and medullated fibers other than kemp, but the results did not justify the use of more than these 2 positions when the three types of fibers were considered. "The three regression equations for 38 positions on the side and thigh provide the necessary information for use in estimating the average amounts of the three types of fibers in the fleece from data for the 2 selected positions."

Mississippi-grown oats and barley, plus corn, for fattening pigs, P. G. BEDENBAUGH (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 7, pp. 1, 2).—In feeding trials of 51 to 57 days' duration, in which five lots of swine were provided with ground oats, corn, and barley, singly or in combination with cottonseed meal and tankage, it was found that 157 lb. of ground corn was roughly equivalent to 181 lb. of ground oats or 178 lb. of ground barley, with protein supplements of cottonseed meal and tankage in each case. A mixture of one-third corn, one-third oats, and one-third barley plus protein supplements required less feed per unit of gain than the single grains plus the protein supplements.

Dehydrated potatoes for fattening pigs, J. H. LONGWELL and M. L. BUCHANAN (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 6, pp. 6-8).—In two feeding trials, the first with 2 lots and the second with 3 lots of 10 pigs each, it was found that dehydrated potatoes may replace up to one-half of the corn in a ration for fattening, but for market competition the price of dehydrated potatoes must be no more than the price of grains.

Absence of nerve degeneration in chronic thiamine deficiency in pigs, M. M. WINTROBE, R. H. FOLLIS, JR., S. HUMPHREYS, H. STEIN, and M. LAURITSEN. (U. S. D. A. et al.). (*Jour. Nutr.*, 28 (1944), No. 4, pp. 283-288, illus. 1).—Continuing these studies (*E. S. R.*, 88, p. 799) with a total of 19 pigs at the Agricultural Research Center at Beltsville, Md., a thiamine-deficient ration failed to support the claim that a lack of this vitamin causes degenerative changes in the nervous system. Autoclaving not only destroys the thiamine but reduces the pantothenic acid content as well, and some of the previous effects thought to be due to thiamine destruction may have resulted from a lack of pantothenic acid.

Requirement of tryptophane by the chick, C. R. GRAU and H. J. ALMQUIST. (Univ. Calif.). (*Jour. Nutr.*, 28 (1944), No. 4, pp. 263-267, illus. 1).—Groups of four to five chicks receiving a mixture of 20 amino acids and rations of zein and gelatin as the only protein sources showed that *dl*-tryptophan was only half as effective as *l* (—)-tryptophan for promoting growth and efficient feed utilization in the chick. The *l* (—)-tryptophan requirement is about 0.25 percent of the ration. The gain per gram of feed consumed increased with larger amount of *l* (—)-tryptophan up to 0.33 gm. per gram of feed consumed, but did not increase thereafter.

Neuropathologic studies of pantothenic acid, biotin, and folic acid complex deficiencies in the chick, J. H. SHAW and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Jour. Nutr.*, 29 (1945), No. 2, pp. 107-112).—On a basal ration only, similar to that previously employed for chicks by Waisman et al. (*E. S. R.*, 89, p. 107), a severe myelin degeneration was prevented and no paralysis occurred when 15 mg. of calcium pantothenate was added, and there were no pathological lesions in the spinal cords of six chicks. The rate of growth was appreciably increased when a 3-percent level of solubilized liver fraction as a source of folic acid was included. The myelin degeneration in the spinal cord was not accompanied by degeneration of the peripheral nerves. The lesions of the spinal cord occurred in pantothenic acid deficiency whether it was produced on a very incomplete ration or on an otherwise complete sucrose ration. Complicating deficiencies did not seem to alter the neuropathological lesions. None of these lesions were observed in chicks suffering from a mild biotin deficiency or an acute deficiency of folic acid complex. Not until sufficient pantothenic acid was supplied did the effects of deficiencies of biotin or folic acid complex appear, and no neuropathological changes were revealed leading to the conclusion that pantothenic acid deficiency is responsible for the changes observed.

The quantitative relationship between stilbestrol response and dietary "folic acid" in the chick, R. HERTZ (*Endocrinology*, 37 (1945), No. 1, pp. 1-6).—A forty-fold hypertrophy of the oviduct of chicks on a stock ration followed the adminis-

condensed whey in the dairy ration and as a calf feed; pasture investigations (noted in part on p. 52); crop production and cost records for alfalfa hay, alfalfa-brome-grass pasture, and various silages; herd management; disease prevention and control, including control of calf pneumonia and mastitis (noted on p. 110); and terracing for soil conservation.

A brief survey of milk production and distribution in Hosur Cattle Farm, P. K. RAJU (*Indian Vet. Jour.*, 22 (1945), No. 1, pp. 27-31).

Recommended nutrient allowances for dairy cattle, J. K. LOOSLI ET AL. (*Natl. Res. Council. Recommended Nutrient Allowances for Domestic Anim.*, No. 3 (1945), pp. 21+, illus. 9).—A further report of the committee on animal nutrition (E. S. R., 92, p. 687).

Influence of vitamin A on the utilization of energy and protein by calves, E. G. RITZMAN, N. F. COLOVOS, H. A. KEENER, and A. E. TEERI (*New Hampshire Sta. Tech. Bul.* 87 (1945), pp. 28).—In experiments carried on for about 4 mo., the effects of vitamin A on the physiological utilization of protein and energy by the body were investigated in six Holstein and three Guernsey calves. Vitamin A deficiency in various degrees caused diarrhea, blindness, muscular spasms, and general signs of decay. More feed was consumed by the calves on deficient vitamin A allowances, but 50 percent less gain was made than by calves receiving adequate amounts of this vitamin. Digestion, absorption, and metabolizability of energy were depressed, but basal metabolism was not significantly affected by differences in vitamin A intake. Protein utilization decreased an average of 25 percent. "The immediate rise in heat production (variously expressed as dynamic stimulus, heat increment, or even as cost of digestion) which results from ingestion of food appears to remain unaffected by low vitamin A intake. Blood glucose content supports the evidence supplied by basal metabolism measurements in showing that vitamin A is primarily essential to body tissues other than those (i. e., muscle) whose function is the conversion of energy. This was also borne out by the nature of the lesions of the tissues which are affected when vitamin A is deficient." The calves received whole milk for the first 2 weeks, after which a grain mixture containing cod-liver oil was gradually increased to 50,000, 100,000, and 500 International Units of vitamin A per 100 gm. of body weight daily in the first experiment. The weights at the start and the end and the intake of feed, protein, and energy from the different sources were recorded. The use of cod-liver oil which included vitamin A and D may have complicated the effects of vitamin A supplements, so carotene and irradiated yeast were used thereafter.

Den produktionssänkande effekten av kastning och överlöpnings hos mjölkkor (The effect of abortion and delayed conception on the milk yield of dairy cows), I. JOHANSSON and C.-V. ANDERSON (*K. Lantbr. Akad. Tidskr.*, 84 (1945), No. 1, pp. 43-65, illus. 6; *Eng. abs.*, pp. 64-65).—"A statistical investigation has been made into the records of some herds of Swedish red and white cattle in order to study the effect of abortion and delayed conception on the milk yield. The following results were obtained: (1) Of a total number of 9,454 calving intervals 13.6 percent were longer than 460 days. About 9 percent of the cows were culled because of failure to reproduce; 50 percent of the total elimination of cows was due to reproductive disturbances. (2) Abortion decreased the milk yield during the preceding lactation [by] about 5 percent, and during the following lactation [by] 30 percent. On an average, each abortion caused 12 to 14 percent decrease in the total milk yield during these two lactations (750 days). Conception was usually delayed after abortion, the calving interval being lengthened with 5 to 10 percent. The milk yield during later lactations was not affected. (3) Delayed conception caused a decrease in the average daily yield during the current calving interval which was not counterbalanced by the increase in yield during the following lactation

The average daily yield of a cow during her second to sixth calving intervals reached its maximum when the average C. I. was 350 days. Within cows any increase in length of the calving interval caused a decrease in daily yield. When the relative length of C. I. changed from 85 to 115, the individual average of the cows being the basis of comparison, each unit (i. e., percent) of increase caused 0.325 percent decrease in the average daily yield of the cows during the interval. The average length of 1,285 calving intervals, which all exceeded 460 days, was 536 days. The decrease in daily yield during these intervals, due to delay of conception, amounted to about 1.7 kg, which means a total loss of 900 kg. of milk per interval."

Analysis of certain factors involved in dairy herd management in New Hampshire. K. S. MORROW, H. A. KEENER, and C. N. HALL (*New Hampshire Sta. Tech. Bul.* 86 (1945), pp. 31, illus. 22).—Analysis of 4,030 lactation records of grade and purebred Ayrshire, Guernsey, Holstein, Jersey, and Milking Shorthorns in New Hampshire dairy herd improvement associations showed that maximum lactation milk yields were obtained at 5 to 6 yr. of age in most of the breeds, but the lactations prior to 3 yr. were definitely longer than those of cows calving after that age. Each breed showed a wider milk: grain ratio when the 3- to 4-year-old groups were compared with the 2- to 3-year-olds. Except Jerseys, lactation milk yields following summer freshening were lower than those for fall and winter freshening. Lactation milk yields were highest following dry periods of approximately 65 days. Maximum 305-day milk-production records were obtained with lactations of approximately 12 mo. The month of freshening had no significant effect on the length of lactation.

The dairy-herd-improvement association program. J. F. KENDRICK (*U. S. Dept. Agr., Farmers' Bul.* 1974 (1945), pp. 22+, illus. 6).—This supersedes Farmers' Bulletin 1604 (*E. S. R.*, 62, p. 257).

List of sires proved in dairy herd improvement associations, 1945 (*U. S. Dept. Agr., Misc. Pub.* 563 (1945), pp. 176).—The ninth annual list (*E. S. R.*, 92, p. 107) by breeds of the 1,886 sires proved between January 1, 1944, and January 1, 1945, with average records of the daughters and their dams.

A correlation of the resazurin grade with the standard plate count of raw milk. N. S. GOLDING and S. I. JORGENSEN. (*Wash. Expt. Sta.*). (*Jour. Milk Technol.*, 8 (1945), No. 4, pp. 189-195, illus. 1).—A total of 1,352 samples of milk collected just as the weather began to get warmer in the spring was examined by the resazurin test in comparison with determinations and bacterial count by the standard methods. The samples were not held for any length of time at higher temperatures. The mean plate count and standard deviation are given for each resazurin grade from 0 to 6, and the distribution of the number of colonies in each grade is indicated by the Lovibond comparator readings at 30 min. and correlated with plate counts. The higher counts did not follow in the pattern of the lower-count milk. The percentage of samples with a plate count under 1,000,000 per cubic centimeter, using grades of 5 and 6, was 91.2 percent, which was practically the same as winter milk. In a 60-min. incubation test with milk obtained from Portland (Oreg.) farmers, with resazurin grade of 4, 74.9 percent had plate counts below 1,000,000; with a grade of 5, 94.7 percent were below this count; and with a grade of 6, less than 1 percent of the samples were above 1,000,000.

Tracing the causes of off-flavors in milk: A guide. G. M. TROUT (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 266-272).—Tracing milk-flavor defects presupposes a knowledge of milk flavors and taste reaction, with history of the defect and the conditions and seasons under which it occurs. Methods of sampling to determine focal points of metal contaminations in the plants are presented.

Onderzoek naar het smaakbederf van boter door opslag bij lage temperatuur (Investigation into the bad taste of butter as a result of storage under low temperature), M. VAN DER WAARDEN ([Netherlands] Dept. Landb. en Vissch., *I'erslag. Landbouwk. Onderzoek.*, No. 50 (2) G (1944), pp. 80+, illus. 5; *Ger., Eng. abs.*, pp. 56-58, 78-79).—Substances affecting the flavor of butter were obtained in a very concentrated state from fresh butters without taint and from cold-storage butters with and without a deficient flavor. To obtain the concentrates, the butter was degassed in a high vacuum at 75° C. and the gas condensed at -80° and -196°. Evidently the factors affecting the flavors of butter are among the most volatile constituents of the butterfats. The chemical nature of the flavors may be revealed by further analysis of their chemical composition and texture. Nonvolatile peroxides and aldehydes are formed considerably more extensively in butter with poor than in those with good keeping qualities, but these oxidation products do not influence the flavor of storage butters on account of their low volatility. Small quantities of volatile aliphatic aldehydes—including those with a positive Kreis reaction—and larger quantities of volatile acids are also formed more frequently during storage in butters with poor than with good keeping qualities. The direct cause of taints of storage butters cannot be trimethylamine, which might be formed from lecithin by oxidation. No flavors resembling those of butter with cold-storage flavors were produced by adding oxidation products of fats such as low-molecular aliphatic normal monoaldehydes, monoketones, and monoacids. Thus it seems unlikely that these products contribute to the defects.

In a second part a method is proposed for separating butter into fat, a water, protein, and phosphate phases so that important modifications of the metallic bonds are regarded as impossible. Minute quantities of copper, iron, and phosphorus in butter and its constituents were identified in unsalted butter. Additions of iron, copper, and phosphorus to butter remained in the same form as those present in butter.

Extensive lists of references are included.

Propionic acid, sodium propionate, and calcium propionate as inhibitors of mold growth.—I, Observations on the use of propionate-treated parchment in inhibiting mold growth on the surface of butter, J. C. OLSON, JR., and H. MACY. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 9, pp. 701-710, illus. 2).—Continuing previous investigations (E. S. R., 81, p. 833), there was little advantage in using a mixture of two salts—NaCl and sodium propionate—over the straight NaCl when salted butter was wrapped. Either calcium or sodium propionate was, however, more effective in inhibiting mold growth than a saturated NaCl solution. Low-temperature prestorage at -10° F. for 1, 2, and 3 mo., and subsequent holding at 40°-50° in propionate-treated wrappers did not prevent subsequent mold growth on storage at high temperature. Unsalted butter wrapped in parchment treated in a 5-percent calcium propionate solution at pH 5.5 showed marked superiority in keeping quality to controls, or other prints wrapped in parchment treated in unacidified solutions, as judged by surface flavor. All controls showed mold growth and flavor deterioration after 2 weeks, though the butter was not artificially infected, thus showing a lack of proper methods of mold control in manufacture. Calcium-propionate-impregnated parchments were effective in preventing mold growth in butter only when used in dry wrappings. Heating did not impair the effectiveness of acidified or unacidified propionate in preventing mold growth. The *Penicillium* used was markedly more resistant to the inhibiting effect of these propionates than species of other genera studied.

Lactic acid and titratable acidity of commercial dried and evaporated milk in Michigan, I. A. GOULD and F. M. SKOVEN (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 260-264).—Employing methods of Hillig (E. S. R., 78, p. 447) for

measuring lactic acid, results are presented for the lactic acid development on 35 samples of dry milk solids (not over 1.5 percent fat) and on 18 samples of evaporated milk. The average lactic acid content of 15 summer samples of dry milk was 0.018 percent, while 20 winter milk samples averaged 0.008 percent. The average titratable acidities for the summer and winter samples were 0.155 and 0.130, respectively. The average lactic acid content of 7 summer samples of evaporated milk was 0.013 as contrasted with 0.006 percent for winter samples. The possibility of establishing lactic acid standards for these products is discussed.

Some observations on the keeping quality of spray-dried whole milk stored at room temperature, J. H. HETRICK and P. H. TRACY. (Univ. Ill.). (*Jour. Dairy Sci.*, 28 (1945), No. 9, pp. 687-700, illus. 2).—Observations were made on the keeping quality of whole milk powder processed by forewarming the condensed milk to 140°-145° F. and spray drying, using a No. 69 nozzle at 250 lb. spray pressure. The air inlet and outlet temperatures were about 300° and 180°, respectively, with storage in air and nitrogen for 375 days at room temperature. In general, all gas-packed samples remained satisfactory for this period, but those packed in air became unsatisfactory from the standpoint of flavor. Air-packed as contrasted with nitrogen-packed samples showed more rapid oxygen absorption, more evolved CO₂, and greater loss of ascorbic acid. There were no significant changes in the pH, acidity, or solubility in the samples observed during the storage period. Lessening palatability changes of gas-packed powder were affected by additions of 200 p. p. m. of sodium araboascorbate (milk basis) and 0.2 percent wheat germ oil (fat basis) to the condensed milk before drying, but some improvement was noted in air-packed samples of powder. Oxygen absorption was more rapid in air-packed samples containing sodium araboascorbate, but deterioration of flavor was not as rapid as in the powder containing wheat germ oil. Evidently oxygen was utilized in the oxidation of the ascorbate. A cooked flavor was characteristic of samples containing sodium araboascorbate. More loss in palatability occurred in air-packed samples supplied with a No. 79 nozzle at 2,000 lb. pressure than in controls. A lighter and fluffier powder was secured by 250 lb. than 2,000 lb. pressure.

"Powder stored in atmospheres containing at equilibrium different amounts of oxygen (2.7-4.8 percent) showed a tendency toward greater loss in palatability and ascorbic acid throughout the storage period as the equilibrium oxygen percentage was increased. Differences in palatability among the samples in this series were not particularly great even at the 375-day storage period, all having fallen 3 to 4 points in flavor score. The oxygen contents had not fallen to zero after 375 days, and the amounts remaining were considered sufficient to cause progressively greater differences in palatability as the storage period lengthened. Observation on two of these series after 540 days of storage strengthened this belief. A series from this same lot of powder stored in an atmosphere containing 71 percent carbon dioxide and 0.65 percent oxygen at equilibrium showed very little change in palatability after 375 days of storage. This indicates that, at least in the presence of small amounts of oxygen, carbon dioxide can be considered a satisfactory gas to use in combination with nitrogen for storing milk powder; in fact, the sample after 375 days of storage possessed the best flavor of any lot in the experiment." The initial flavor loss was described as fresh flavor loss or staleness which did not resemble fat oxidation.

A bibliography of 20 references on the storage of dried milk is included.

Honey in ice cream, P. S. LUCAS (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 4, pp. 377-381).—A general statement on the use of honey as a sweetening agent for ice cream, including directions for calculating mixes with it.

VETERINARY MEDICINE

Lehrbuch der Veterinär-Physiologie [A textbook of veterinary physiology], A. SCHIEUNERT, A. TRAUTMANN, and F. W. KRZYWANIEK (Berlin: Paul Parey, 1944, 2. ed., pp. 456+, illus. 177).—A second edition (E. S. R., 82, p. 249).

[**Veterinary research in Brazil**] (*Arq. Inst. Biol. [São Paulo]*, 15 (1944), pp. 3-11, 81-96, 209-238, 263-288, 331-342, illus. 28).—These articles include Verificação de Púlorose em Uru (*Odontophorus capucira*) [Pullorum Disease in the Uru], by P. Nobrega and R. C. Bueno (pp. 37-38, Eng. abs. pp. 37-38); Sobre o Uso de Desinfetantes na Água de Bebida, para Prevenção da Cólera Aviária [Addition of Disinfectants to the Drinking Water To Prevent Fowl Cholera], by J. and A. S. Reis (pp. 39-41, Eng. abs. p. 41), recommending the use of copper sulfate; Estudos Sobre a Peste Suína—I, O Papel da Associação Microbiana; II, A Reação do Sistema Reticulo-endotelial [Studies on Swine Fever—I, The Role of Associated Bacteria; II, The Reaction of the Reticulo-endothelial System], by P. Bueno (pp. 81-96, Eng. abs. pp. 85-86, 95); Estudos de Imunidade Cruzada Entre o Vírus Brasileiro da Encefalomielite Infecciosa do Cavalo e os Vírus Americanos—Pelas Provas de Soro-Neutralização [Immunological Relationships Between the Brazilian and American Viruses of Equine Encephalomyelitis Through Cross-Neutralization Tests], by V. Carneiro (pp. 209-238, Eng. abs. pp. 234-235), which includes a bibliography of 40 references; Osteofibrose dos Equídeos no Brasil "Cara Inchada" [Osteofibrosis in Equines in Brazil], by J. Moreira and C. H. Florence (pp. 263-288, Eng. abs. pp. 284-285), with a bibliography of 45 references; Comportamento do Vírus da Encefalomielite Infecciosa do Cavalo por Inoculação na Membrana Corioalantoide de Embrião de Marreco [The Behavior of the Virus of Equine Encephalomyelitis on the Chorioallantoic Membrane of the Duck Embryo], by V. Carneiro (pp. 331-338, Eng. abs. pp. 337-338); and Sobre o Reconhecimento de Portadores na Cólera Aviária [The Detection of Fowl Cholera Carriers], by P. Nobrega and R. C. Bueno (pp. 339-342, Eng. abs. p. 342).

[**Veterinary research in Australia**] (*Austral. Vet. Jour.*, 21 (1945), No. 2, pp. 22-38, illus. 6; *Sup.*, illus. 5).—Among the articles in this issue are the following: Trombidiosis of Sheep in Queensland, by D. A. Gill, G. R. Moule, and R. F. Rick (pp. 22-31), found to be caused by *Trombicula sarcina*; Scab in Sheep in Australia and Its Eradication, by J. D. Stewart (pp. 32-35); Congenital Goitre in Lambs in Tasmania, by W. H. Southcott (pp. 35-36); Salt Poisoning of Sheep Following Evaporation of Saline Waters, by G. R. Moule (p. 37); and A Note on the Relative Toxicity of Sodium Trichlorophenate for Sheep, by G. H. Allen (p. 38).

[**Veterinary research in India**] (*Indian Jour. Vet. Sci. and Anim. Indus.*, 14 (1944), No. 1, pp. 1-12, 25-26, 34-36, 56-58, 60-61, illus. 17).—This issue contains the following articles: The Problem of Equine Strangles in India, by F. C. Minett (pp. 1-12), a comprehensive discussion of the incidence and mortality of this serious Indian disease as encountered at remount depots and breeding farms; *Nerium odoratum* (Oleander) Poisoning in Livestock, by N. Das Kehar and G. Rau (pp. 25-26); A Case of Pseudotuberculosis (*Pasteurella pseudotuberculosis* infection) in the Goat, by V. R. Rajagopalan and N. S. Sankaranarayanan (pp. 34-36); A Preliminary Note on Cutaneous Rinderpest, by A. D. MacGregor (pp. 56-58); and Some New Records of Nematode Worms From Indian Ruminants, by M. M. Sarwar (pp. 60-61).

Some newer chemotherapeutic agents, D. F. GREEN (*North Amer. Vet.*, 26 (1945), No. 7, pp. 407-414).—This discussion deals largely with penicillin, with brief reference to streptomycin and DDT.

Penicillin in veterinary medicine, W. H. RISER (*North Amer. Vet.*, 26 (1945), No. 7, pp. 415-418, 424).—This brief discussion includes a table listing animal disease organisms susceptible to the action of penicillin.

A new method for the production of potent inactivated vaccines with ultra-violet irradiation.—II. Sterilization of bacteria and immunization with rabies and St. Louis encephalitis vaccines, S. O. LEVINSON, A. MILZER, II. J. SLAGHNESSY, J. L. NEAL, and F. OPPENHEIMER (*Jour. Immunol.*, 50 (1945), No. 6, pp. 317-329).—A new method has been developed for completely killing or activating turbid suspensions of bacteria and viruses in less than 1 sec. by exposing continuously flowing thin films to far and extreme ultraviolet irradiation. Intensity, film thickness, time of exposure, and distance have been so standardized that experiments could be duplicated with consistent results. By means of this new technic, suspensions containing approximately one billion organisms per milliliter of the following bacteria were completely killed in 0.17 to 0.33 sec. exposure to ultraviolet rays: *Bacterium coli*, *Eberthella typhi* (strain 58), *Salmonella enteridis*, *Staphylococcus aureus*, *Streptococcus viridans*, and *Diplococcus pneumoniae* (type 1).

Several lots of rabies vaccine inactivated by this irradiation technic consistently induced a higher degree of immunity in mice than control phenolized vaccines. The irradiated rabies vaccines exhibited no significant loss of potency after six months' storage at 5° C. Two lots of St. Louis encephalitis vaccine so inactivated conferred a high degree of immunity in mice. However, irradiation of rabies or St. Louis encephalitis viruses beyond the optimal time necessary for complete inactivation caused progressive diminution of antigenicity.

Anthelmintic bioassay of simple saturated hydrocarbons, J. H. WHITLOCK. (Kans. Expt. Sta.). (*Cornell Vet.*, 35 (1945), No. 3, pp. 214-220, illus. 1).—Using methods previously described (E. S. R., 88, pp. 823, 824), uniform male albino rats were infected with a standard dose of infective larvae of *Nippostrongylus muris*, treated with the test substances on the eighth day, and killed on the tenth day. The nema mortality in the test animals was compared with that of the untreated controls.

The utility of bioassay tests in anthelmintic research was demonstrated. Petroleum hexane, synthetic hexane, and cyclohexane were shown to be effective anthelmintics. Of these, petroleum hexane was more efficient per cubic centimeter against *N. muris*, and this finding was confirmed by tests with sheep heavily infected with various trichostrongylids. It was found to be an efficient adjuvant to carbon tetrachloride, allowing a reduced dose of the latter, and its activity was apparently enhanced by emulsification. It was also about as efficient as carbon tetrachloride in treating gastrointestinal parasites of sheep, but because of a tendency to cause bloat it will probably be useful only as an adjuvant to the halogenated hydrocarbons.

The history and distribution of anthrax in livestock in the United States, C. D. STEIN. (U. S. D. A.). (*Vet. Med.*, 40 (1945), No. 10, pp. 340-349, illus. 2).—This historical account includes a tabulation by States of the incidence of anthrax in livestock since 1915. A gradual increase in the area involved is noted, although since 1937 there has been a steady decline in outbreaks in the Northwest. "Recognized areas of infection of large dimensions exist in South Dakota, Nebraska, Arkansas, Mississippi, Louisiana, Texas, and California, while small areas exist in Vermont, New Jersey, Delaware, Wisconsin, Utah, Nevada, and Oregon."

Prevention of Brucella allergy in veterinarians, I. F. HUDDLESON. (Mich. Expt. Sta.). (*North Amer. Vet.*, 26 (1945), No. 8, pp. 466-468).—A number of cases are described of skin eruptions and other symptoms attributed to *Brucella* allergic reactions which arise from contact with fetal membranes and other infective materials. These reactions, it is reported, may be avoided by wearing a protective covering on the hands and arms or by rubbing a *Brucella* agglutinating serum over exposed areas of the skin.

Foot-and-mouth disease: Its epizootiological aspect, D. CABOT (*Vet. Rec.*, 57 (1945), No. 32, pp. 375-379).—This paper and accompanying discussion deals with avenues of infection and means of control. The author concludes that "vaccination can have no place side by side with a policy of eradication."

Rat transmitted paralytic rabies, R. T. GILYARD (*Cornell Vet.*, 35 (1945), No. 3, pp. 195-209, illus. 2).—A form of rabies characterized by a fatal progressive paralysis is described as associated with the vampire bat, which acts as both transmitter and carrier. Control measures in Trinidad, Venezuela, and Brazil are noted. A special vaccine is employed, together with bat suppression measures, and is believed to prevent extensive cattle losses.

A hitherto undemonstrated zooglyphic form of *Mycobacterium tuberculosis*, E. ALEXANDER-JACKSON (*Ann. N. Y. Acad. Sci.*, 46 (1945), Art. 2, pp. 127-151, illus. about 6).—Use of a new staining technic, which is described, resulted in a finding that *M. tuberculosis* exists not only as rods or granules but also as a zooglyphic plasmodium consisting of granules or larger globoid bodies surrounded or enmeshed by amorphous material.

Studies on the hemorrhagic sweet clover disease.—XIV, **Hyperprothrombinemia induced by methylxanthines and its effect on the action of 3,3'-methylenebis-(4-hydroxycoumarin)**, J. B. FIELD, E. G. LARSEN, L. SPERO, and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 725-737, illus. 2).—Continuing this series (E. S. R., 91, p. 631), it is shown that single oral doses of the methylxanthines, theophylline, theobromine, and caffeine induce in the dog, rabbit, and rat a state of hyperprothrombinemia which persists in the dog for 4 to 5 days. The methylxanthines can also counteract the hypoprothrombinemic action of the anticoagulant 3,3'-methylenebis (4-hydroxycoumarin) in the dog, single doses protecting a standardized dog against repeated doses of the anticoagulant for periods up to 14 weeks. It is suggested that the methylxanthines produce a functional stimulation of hepatic tissue which accounts for the hyperprothrombinemia in normal animals and for the protective action against the anticoagulant. A possible bearing of these findings on the use of methylxanthines in conjunction with cardiovascular therapy is suggested.

Moldy grain can cause livestock losses, J. O. FOSS (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 6, p. 16).—A loss of 25 out of 100 month-old pigs is reported following a single feeding of moldy corn, from which *Gibberella* sp. was identified.

A review of bloat in ruminants, H. H. COLE, C. F. HUFFMAN, M. KLEIBER, T. M. OLSON, and A. F. SCHALK (*Jour. Anim. Sci.*, 4 (1945), No. 3, pp. 183-236).—This, the fourth report of the committee on animal health of the National Research Council, is presented as a comprehensive review and discussion of all phases of the bloat problem, including gaps in present knowledge. Sections, prepared by individual members, deal with the seriousness of the problem, conditions under which bloat occurs, sources of rumen gases, factors influencing the rate and type of gas formation, expulsion of gas from the rumen, and the experimental production, prevention, treatment, and theories of bloat. Appended are 222 literature citations.

Bloat in cows on alfalfa pasture, H. H. COLE and M. KLEIBER. (Univ. Calif.) (*Amer. Jour. Vet. Res.*, 6 (1945), No. 20, pp. 188-193).—Continuing earlier work (E. S. R., 90, p. 678), animals with a rumen pressure of 60 mm. of mercury were regarded as in a serious condition. The feeding of 17 lb. per head of Sudan hay completely prevented bloat, but only when cattle had access to all the hay they would consume overnight prior to pasturing on alfalfa. The Sudan hay feeding increased the alfalfa consumption in some instances, especially if no concentrates were fed; when both concentrates and Sudan hay were fed, most cows ate less alfalfa than if only concentrates were given.

Insensible losses of body weight of a cow on alfalfa pasture in September were found to be considerable during the heat of the day, averaging about 3 lb. per hour.

Factors affecting the tube agglutination test for Bang's disease, T. MOORE and C. MACKIE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 7, pp. 192-196).—Experiments were conducted to study the effect on the tube agglutination

test of constant agitation during the period of incubation at 37° C., the length of incubation time at this temperature, and water-bath incubation at 42°. Incubation at 37° for 24 hr. and room temperature for 8 hr. gave the largest number of positive reactions, while agitation greatly reduced the number of reactions. Incubation of five sets of serum dilutions for 12, 24, 48, 72, and 96 hr. suggested the advisability of increasing the length of the incubation period at 37° in routine tests, especially in herds in which the infection is difficult to control. Use of the water bath showed that the number of positive and questionable reactions was very much less by this method. Tubes in which the serum-antigen mixture was completely submerged showed fewer reactions than was the case when the mixture was only one-half submerged.

An observation on reduction in milk yield following vaccination of lactating cows with living vaccines prepared from *Brucella abortus*, H. H. HOLMAN and A. McDIARMID (*Vet. Rec.*, 28 (1945), No. 57, pp. 335, 336, illus. 1).—Comparisons with 15 controls of 6 cows inoculated with strain 19 *B. abortus* vaccine and 8 cows inoculated with 2 doses of 45/20 vaccine showed a total loss in milk yield per inoculated cow over an 11-day period of 24 lb. The loss was most pronounced during the period from 2 to 4 days after inoculation and negligible 9 days after inoculation. Variation in individual loss ranged from 0.3 to 80 lb.

Further results from vaccination, C. M. HARING and J. TRAUM (*Holstein-Friesian World*, 42 (1945), No. 16, pp. 1240-1241).—Results secured in work with bovine brucellosis control are briefly noted.

Leptospira in bovine icterohemoglobinuria, H. MARSH. (Mont. Expt. Sta. et al.). (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 822, pp. 119-121).—Following a loss on a Montana ranch of over 25 purebred Hereford calves from an acute disease characterized by hemoglobinuria, spirochetes were found in tissue sections of the liver which corresponded in morphology to descriptions of *Leptospira*. See also a note by Jungherr (E. S. R., 92, p. 562).

Investigations on keratoconjunctivitis in cattle on the Gulf Coast of Texas, J. J. REID and L. ANIGSTEIN. (Tex. Expt. Sta.). (*Tex. Rpts. Biol. and Med.*, 3 (1945), No. 2, pp. 187-203, illus. 7).—This disease, widely distributed among range, semirange, and feed-lot cattle on the North American Continent and reported in ruminants from various countries in Europe and Africa, was investigated as to epizootic and etiological phases. The disease is highly contagious among cattle, the eye and nasal discharges being the sources of infection. Although it is prevalent throughout the year, the highest incidence coincides with the summer season.

The disease can be readily transmitted experimentally in calves by contact with the eye or nasal exudates, but bacteria-free filtrates from the discharges are non-virulent. In few instances bacteria-free conjunctival scrapings from acute cases were obtained and inoculated into developing eggs. As a result, hemorrhagic lesions and deaths were noticed in certain proportions of incubated chick embryos, and on frequent occasions, microscopic examination of yolk sacs revealed coccoid bodies resembling rickettsiae or "inclusion bodies." However, attempts to infect the eye of susceptible calves with this bacteriologically sterile material invariably yielded negative results.

Systematic investigation of the bacterial flora of infectious keratoconjunctivitis revealed, in addition to various coccal organisms cultivated on ordinary media, a hemophilic and hemolytic bacillus which requires blood or serum for growth. Experimental keratoconjunctivitis in cattle, sheep, and goats was produced by young cultures of this bacillus. In addition, agglutinins specific for this organism were found in the sera of cattle convalescent from the natural or experimental infection.

It is concluded that this hemolytic diplobacillus is the specific causal agent in cattle. Morphological as well as cultural and pathogenic characteristics indicated close relationship if not identity with *Hemophilus bovis*, but it is suggested that if the organism should be found in spontaneous keratitis of sheep and goats (both of which proved susceptible to the experimental infection), the designation *H. ruminantium* would seem more appropriate.

Mastitis (*Missouri Sta. Bul.* 488 (1945), pp. 25-30).—Results of diathermy treatments are tabulated and discussed. Under the conditions of the experiment, there was a definite improvement in the physical condition of the udder and the appearance of the milk. "Ninety percent of the recent infections and 44 percent of the old infections were arrested by the treatments, judged by the test made at the time of last treatment and later observations in the case of animals retained in the herd."

Bovine mastitis caused by a corynebacterium not previously described, C. C. PALMER, J. C. KAKAVAS, and E. S. BIDDLE. (*Univ. Del.*). (*North Amer Vet.*, 26 (1945), No. 7, pp. 401-404).—An outbreak is described in which 20 in a herd of approximately 65 milking cows became infected with a corynebacterium described as very similar to *Corynebacterium bovis* and *Bacterium lipolyticum*, but with some marked differences. This organism has not been found in milk except that from animals usually showing mastitis. The resulting disease seems to be self-limiting, associated with large production, and with heavy feeding a predisposing factor.

Characteristics of staphylococci and staphylococcal toxins, L. W. SLANETZ, A. F. HOWE, and H. P. MACLEOD (*New Hampshire Sta. Tech. Bul.* 84 (1945), pp. 16).—This bulletin presents the results of a study of 328 strains of staphylococci which were isolated from the udders of cows showing evidence of mastitis infection and 71 cultures obtained from various human infections. Several methods were employed, but the coagulase test and tests for hemolysis in sheep blood agar or broth proved to be the most consistent and reliable reactions for the differentiation of the staphylococci studied. On the basis of these tests, the 328 strains were classified into three groups. The group 1 organisms are coagulase positive and hemolyze sheep red blood cells in agar and in broth; group 2 cultures are coagulase negative and produce hemolysis on sheep blood agar; and group 3 strains are coagulase negative and are nonhemolytic. Sheep plasma was found to be as effective for the coagulase test as human or rabbit plasma.

As causative agents of staphylococcal mastitis, the group 1 staphylococci appeared to be the most virulent, the group 2 cultures less virulent, and the group 3 organisms weakly pathogenic or nonpathogenic on the basis of leucocyte counts of the milk and clinical evidence of mastitis in the cow. The strains of staphylococci isolated from human infections were similar to those isolated from cases of bovine staphylococcal mastitis, indicating that these organisms may cause disease in either humans or animals.

All of the strains studied by the authors produced alpha and beta or beta hemolysins, including those which were definitely incriminated in food poisoning outbreaks. The studies revealed that 91.7 percent of these cultures produced alpha and beta toxin, 6.7 percent formed only beta toxin, and 1.6 percent formed only alpha toxin. While, in general, alpha toxin was more heat labile than the beta toxin, it was found that alpha toxins of high potency may not be completely inactivated by a temperature of 100° C. for 30 min. Although the potency of beta toxin filtrates was reduced by heating, this toxin was also not entirely inactivated by a temperature of 100° for 30 min. No evidence of enterotoxin could be detected in the filtrates of 10 strains of staphylococci isolated from cows and 6 cultures from cases of human food poisoning. However, beta toxin was found to produce definitely enterotoxin reactions in kittens. Consideration of the relationship of beta toxin to enterotoxin indicated that "the frequency with which beta-toxigenic strains

may be found in raw cow's milk does not necessarily indicate that these are not enterotoxigenic or that a much higher incidence of milk-borne staphylococcal food poisoning would prevail if they were enterotoxigenic. Pasteurization and proper refrigeration of milk would appear to be the important factors governing the incidence of such outbreaks."

The effect of penicillin on staphylococci and streptococci commonly associated with bovine mastitis, E. J. FOLEY, S. W. LEE, and J. A. EPSTEIN (*Jour. Milk Technol.*, 8 (1945), No. 3, pp. 129-133).—Experiments are described which indicate that *Staphylococcus aureus*, *Streptococcus agalactiae* and *S. mastidis* (Lancefield's Group B), and *S. zooepidemicus* and *S. dysgalactiae* (Lancefield's Group C) are highly susceptible to as small amounts as 1 to 2 Florey units of penicillin. Total killing of viable streptococci was accomplished within a matter of hours. Penicillin was found to be at least as effective as gramicidin against these organisms and far more effective against *Staphylococcus aureus*.

Can a differential germ test with a leucocyte count be used in the control of mastitis? N. O. GUNDERSON and C. W. ANDERSON (*Jour. Milk Technol.*, 8 (1945), No. 3, pp. 147-152).—This is an attempt to summarize present knowledge regarding the early recognition and control of infectious mastitis. Since it appears that the number of leucocytes in milk follows a definite pattern of variation, directly related to stage of lactation, disease, and age of the dairy animals, this information may be used in the early recognition of and recovery from udder disease, provided the leucocyte count is properly interpreted in terms of the interfering factors involved. The differential germ test, applied to properly collected milk samples, is regarded as an essential control measure, but it is pointed out that good herd management and sanitation practices must be carried out in conjunction with the laboratory examinations.

Recent advances in mastitis control, C. S. BRYAN, J. W. CUNKELMAN, and F. W. YOUNG (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 4, pp. 382-385).—A brief summary of control methods, including good sanitary milking and herd management procedures, early and accurate diagnosis, elimination from the herd of infected cows with badly damaged udders, and early treatment of udder infections with udder infusions.

Comments on how to handle the mastitis problem, C. S. BRYAN. (Mich. State Col.). (*Jour. Milk Technol.*, 8 (1945), No. 3, pp. 157-161).—This address discusses the significance of mastitis and the use and limitations of udder infusions in its control. The importance of cooperation of all agencies concerned is stressed.

Bovine pasteurellosis: The occurrence of haemorrhagic septicaemia and bronchopneumonia simultaneously in one outbreak among young calves, D. W. P. BYTHILL (*Vet. Rec.*, 24 (1945), No. 57, pp. 289, 290).—An outbreak of pasteurellosis in young calves is described in which two types of the disease occurred simultaneously. Calves dying within 3 days of birth revealed post-mortem findings characteristic of hemorrhagic septicemia, while the survivors were affected with broncho-pneumonia lasting for 2 mo. or more.

Comparative intradermal tuberculin test and post-mortem examination of 50 cows, J. M. MURPHY (*Vet. Rec.*, 57 (1945), No. 30, pp. 356-357).—A table is given reporting reactions and post-mortem examinations of 50 cows receiving avian and mammalian tuberculin, including mammalian tuberculin in the caudal fold and vulva sites.

Properties and pathogenicity of a virus derived from sheep dermatitis, F. R. SELBIE (*Brit. Jour. Expt. Pathol.*, 26 (1945), No. 2, pp. 89-97, illus. 1).—A virus, derived from an outbreak of sheep dermatitis in lambs in 1936 and pathogenic to the rabbit, had by 1945 been transmitted to the guinea pig, but apparently lost its virulence to the lamb. This virus is described as closely related to the virus of

contagious pustular dermatitis, perhaps differing only in its adaptability from other strains that have been isolated.

Further observations on chronic ovine laryngitis, J. W. BRITTON. (Calif. Expt. Sta.). (*Cornell Vet.*, 35 (1945), No. 3, pp. 210-213).—Additional observations (E. S. R., 90, p. 395) based on a study of 45 chronic cases are reported. These tended to support "the theory that this disease is caused by the wounding of the arytenoid cartilages by grain awns or other foreign objects." As seen in California, it is chiefly a disease of young ram lambs while getting on full feeds of whole grains, especially barley or oats but also probably any harsh irritant feed. Operational procedures are deemed impracticable because of the inaccessibility of the arytenoids, but intravenous and oral treatments with sodium iodide were followed by some recoveries and are thought to offer some possibilities to individuals that are not sensitive to the drug.

Outbreak of haemonchosis in feeder lambs, J. H. WHITLOCK, L. M. RODERICK, E. E. LEASURE, and R. P. LINK. (Kans. Expt. Sta.). (*Cornell Vet.*, 35 (1945), No. 3, pp. 273-275).—A case report of severe death loss following the administration of phenothiazine to Texas feeder lambs, although giving evidence of the effectiveness of half doses in outbreaks of haemonchosis. It appeared that severe hemoglobin depletion in this disease is not manifested until egg counts reach 3,000 per gram of feces, and that the correlation between egg count and hemoglobin loss is very poor.

Trichostrongylosis of sheep and goats, R. D. TURK. (Tex. A. and M. Col.). (*North Amer. Vet.*, 26 (1945), No. 8, pp. 474-476).—Heavy infections in both lambs and goats of *Trichostrongylus* spp., especially *T. colubriformis*, are reported following fall rains breaking a summer and fall drought. It is pointed out that the embryonated eggs of the trichostrongyles are very resistant to drying, and if development is checked by lack of moisture the eggs may remain alive for many months and eventually cause sudden and very heavy infections. Because of the small and inconspicuous character of the parasites and the absence of obvious gross lesions, fatal infections may be overlooked even at autopsy, although revealed by careful examination of the abomasum and first 20 ft. of small intestine. It is emphasized that anthelmintics alone are not sufficient for control, as adequate nutrition and pasture rotation are essential, the former by building resistance and the latter by preventing reinfection.

A disease called "bullnose" occurring in swine in Prairie Provinces, R. CONNELL (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 8, pp. 224-228).—An account is given of a disease affecting swine in the Canadian Prairie Provinces and recently becoming rather prevalent, especially in Alberta. This disease is believed to be identical with a type of rhinitis described from Indiana by Doyle et al. (E. S. R., 92, p. 269). Marketing the entire herd is recommended.

Outbreak of vesicular stomatitis in swine and its differential diagnosis from vesicular exanthema and foot-and-mouth disease, H. W. SCHOENING and A. B. CRAWFORD (*U. S. Dept. Agr. Cir.* 734 (1945), pp. 14, illus. 1).—This circular reports an outbreak of vesicular stomatitis that occurred in 1943 in hog-cholera immune and hyperimmune hogs used in the preparation of anti-hog-cholera serum in a commercial biological establishment at Kansas City, Kans. In this outbreak, 417 of 787 large hogs developed the disease, whereas only 1 of approximately 500 virus, test, and stocker pigs became infected. Twelve yearling calves, exposed by direct and indirect contact to the swine, were refractory to the disease. In tests made for the purpose of diagnosis, cattle, horses, hogs, and guinea pigs were found to be susceptible to epithelial inoculation, whereas goats were refractory. These findings, as well as results of tests involving intramuscular, subcutaneous, and intravenous inoculations, showed definitely that the disease was vesicular stomatitis. Other tests

showed that the virus causing the outbreak was a filter-passing organism, thereby agreeing with the two known types that produced the disease. Tests in swine of hog-cholera virus and anti-hog-cholera serum prepared prior to the diagnosis of the disease were negative for the presence of the virus of vesicular stomatitis. No definite source of the virus causing the outbreak was found. Investigation showed no infection (1) on the farms from which any of the hogs used at the establishment were obtained, (2) among the contact calves, or (3) in the feed or water given to the animals. It was concluded, however, that there was a slight possibility that one of the virus pigs had an inapparent vesicular stomatitis blood infection at the time it was used for virus production.

[**Anaplasmosis in the horse**], A. BRION (*Compt. Rend. Soc. Biol. [Paris]*, 138 (1944), No. 15-16, pp. 537-540).—Two brief notes are given, of which the first, *L'Anaplasmosse du Cheval et son Parasite Causal* (pp. 537-539), reports a new disease as present in Haute-Savoie since 1941. This disease is differentiated from typhoid fever, infectious anemia, and both true piroplasmosis and nuttalliosis. In the second note, *Transmission Expérimentale de l'Anaplasmosse du Cheval* (pp. 539-540), its pathogenicity is attributed specifically to *Anaplasma equi*.

Equine infectious anaemia: Attempted vaccination with crystal violet tissue vaccine, J. C. BANKIER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 7, pp. 197-199).—Experiments are described which dealt with an attempt to produce a vaccine in which the virus of infectious anemia was inactivated with crystal violet combined with glycerine. The resultant material possessed no property of stimulating immunity to an appreciable degree in susceptible horses. Intradermal inoculation of virus in a dilution of 1:10,000 did not produce infection in 55 days, nor did this small amount of virus following the inactivated virus stimulate an appreciable degree of immunity.

One of the four colts inoculated had been used previously in an experiment in which it had been inoculated with lymphocytic choriomeningitis virus and resisted the challenge inoculation. The possibility of cross immunity to infectious anemia is suggested.

Quantitative study of the neutralization of western equine encephalomyelitis virus by its antiserum and the effect of complement, I. M. MORGAN (*Jour. Immunol.*, 50 (1945), No. 6, pp. 359-371, illus. 6).—This paper reports a series of observations dealing with neutralization of the virus of western equine encephalomyelitis by antisera of various species. A quantitative study revealed that the antiserum-virus relationship varies according to the method of handling the serum and of carrying out the neutralization test.

Climatic factors as related to the incidence of equine strangles in India, F. C. MINETT (*Indian Jour. Vet. Sci. and Anim. Husb.*, 14 (1944), No. 2, pp. 75-94, illus. 12).—Continuing the work noted on page 106 it was found that as studied in India equine strangles is chiefly a disease of the colder months. Meteorological data reported indicate a relationship with extremes of temperature and humidity and a transient and perhaps seasonal defect in the mechanism of immunity. Better protection of the young horses and mules against cold and winter rains is recommended.

The immunization of foxes and dogs to distemper with ferret-passage virus, R. G. GREEN and W. E. CARLSON (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 822, pp. 131-142).—Studies are reported in which it was found that foxes and dogs inoculated with ferret-passage distemper virus become immune to natural dog distemper. Although foxes show no visible reactions, these animals rapidly develop a degree of immunity sufficient to protect them upon exposure to a virulent epizootic distemper. Dogs vaccinated with the ferret-passage virus commonly show visible, mild reactions, but become immune to distemper even though they show no

reaction. At $3\frac{1}{2}$ and 5 mo. after vaccination, a degree of immunity had been developed in dogs that could not be broken down by maximum exposure. Dosages of 7.5 and 10 mg. immunized consistently and produced generally shorter and milder reactions than a smaller dosage. Ferret viruses of 57, 63, and 79 serial passages appeared to immunize dogs equally well.

Preliminary note on the treatment of anemia in mutant fox pups, C. K. GUNN (*Amer. Fur Breeder*, 18 (1945), No. 2, pp. 30, 32, 34).—An anemic condition among Standard Platinum fox pups of the Quebec and Norwegian mutant strains, 100 percent fatal to affected animals and causing a mortality of over 20 percent in these litters, was studied at the Dominion Experimental Fox Ranch, Prince Edward Island. The anemia was found to occur among pups ranging from 2 weeks to 4 mo. of age. Negative findings as causal agents were found for fleas and earmites, intestinal parasites and potentially pathogenic intestinal bacterial organisms, specific blood parasites, or fecal contamination, and the anemia is thought to result from hereditary lethal factors closely linked with the mutant genes in new type foxes. Iron and liver therapy diets was found beneficial and is suggested as a preventive measure, together with other treatment.

Susceptibility of birds to insulin as compared with mammals, K. K. CHEN, R. C. ANDERSON, and N. MAZE (*Jour. Pharmacol. and Expt. Ther.*, 84 (1945), No. 1, pp. 74-77, 1 illus.).—By intravenous injections of insulin, the canary, pigeon, duck, and rooster were shown to be more resistant than the mouse, rat, rabbit, and dog. Of the birds, the duck was the most, and the rooster the least, sensitive. The latter failed to develop convulsions even with lethal doses of insulin.

The absorption of sulphonamides in the chick and the canary, and its relationship to antimalarial activity, P. B. MARSHALL (*Jour. Pharmacol. and Expt. Ther.*, 84 (1945), No. 1, pp. 1-11, several illus.).—Determinations of the absorption from the gut, whole blood concentration curves ("free" and "total"), and red cell concentration curves ("free") of sulfanilamide and 11 derivatives in the chick and the canary show that these drugs are absorbed more quickly and are excreted more quickly from the blood in canaries than in chicks. Red cell concentration curves are, in most cases, higher in the canary than in the chick.

The drugs showed pronounced activity against *Plasmodium gallinaceum* infections in chicks, but were mostly inactive against *P. cathemerium* in canaries. In general, the degree of antimalarial activity in chicks may be correlated with the height of the blood concentration curves.

See also a previous note by Litchfield (*E. S. R.*, 82, p. 387).

Étude de l'action des sulfamidés sur la formation de la coquille de l'oeuf chez la poule [Action of the sulfonamides on shell formation in hen's eggs], P. GENEST and R. BERNARD (*Rev. Canad. Biol.*, 4 (1945), No. 2, pp. 172-192; *Engl. abstr.* pp. 191-192).—Sulfonamides of both the substituted and unsubstituted types were fed to pullets for weekly experimental periods at levels of 0.3 or 0.5 percent of the dry mash. Unsubstituted sulfonamides caused thin rough-shelled eggs similar to those obtained on feeding sulfanilamide. Repeated experiments with sulfapyridine consistently revealed a decrease in shell thickness as well as a rough surface, but other substituted sulfonamides, including sulfathiazole, sulfaguanidine, sulfamerazine, and sulfadiazene had a negligible effect on shell thickness and the shells were smooth. It is noted that the sulfonamides in which the sulfonamide group is substituted, particularly sulfapyridine, appear to interfere with normal shell formation by inhibiting enzymes other than carbonic anhydrase.

Sulfonamide drugs in the treatment of ulcerative enteritis of quail, H. M. CHURCHILL and D. R. COBURN (*Vet. Med.*, 40 (1945), No. 9, pp. 309-311).—Tests with sulfaguanidine, sulfathalidine, and sulfasuxidine, given in the standard maintenance mash by incorporating 2 percent by weight of the drug, proved ineffective.

Bibliography of poultry diseases (*Bibliog. Poultry Diseases, Lab. Workers Pullorum Disease Control* [New Brunswick, N. J.], 9 (1944), No. 2, pp. 17-).—This issue of this bibliography (E. S. R., 92, p. 419) contains 169 titles.

Blue-comb disease, E. F. WALKER (*New Hampshire Sta. Tech. Bul.* 85 (1945), pp. 11, illus. 4).—Previous work by others is summarized, and studies beginning in 1941 are reported. A filterable agent was isolated from the blood and livers of acutely affected live birds, and a vaccine was prepared from the dried chorio-allantoic membranes of infected chick embryos. Tests with this vaccine in 1942, 1943, and 1944 indicated that it "apparently gives some measure of protection."

Immunization against a lymphoid tumor of the chicken.—I, Attenuation by freezing, C. OLSON, JR. (Mass. Expt. Sta.). (*Cornell Vet.*, 35 (1945), No. 3, pp. 221-230).—Continuing earlier studies with lymphoid tumors (E. S. R., 92, pp. 419, 706), freezing was found to destroy the growth capacity of lymphoid tumor pulp preparations more readily than the immunizing ability. Interruption of the freezing period by an interval of thawing was more injurious to both capacity for growth and ability to immunize than continuous freezing. Preparations of tumors from different donors required different degrees of attenuation to render the growth property innocuous and retain the immunizing ability. It is thought that freezing offers possibilities for the attenuation of a tumor so that it can be used as a tissue vaccine, but the amount of freezing required for attenuation cannot be foretold with the data available.

The distribution and localization of sporozoites and pre-erythrocytic stages in infections with *Plasmodium gallinaceum*, F. COULSTON, W. CANTRELL, and C. G. HUFF (*Jour. Infect. Diseases*, 76 (1945), No. 3, pp. 226-238).—Continuing earlier work by Huff and Coulston (E. S. R., 93, p. 193), the present paper describes the biological evidence on the place of development of the sporozoites and the manner and rate of their dispersal from the point of inoculation. These findings substantiated the previous conclusions. Infectivity tests were made of the blood and organs of chickens bitten by *Aedes aegypti* infected with *P. gallinaceum* or receiving intravenous inoculations of large numbers of sporozoites.

Twenty-fifth annual report of pullorum disease eradication in Massachusetts, H. VAN ROEKEL ET AL. (*Massachusetts Sta. Control Ser. Bul.* 124 (1945), pp. 12).—In further eradication work (E. S. R., 91, p. 749), during the 1944-45 season a record number of 529 flocks and 975,041 tests were dealt with. Of all birds tested, 93 percent were in 100 percent tested nonreacting flocks. The percentage of reactors detected was 0.12. The percentage of reactors among turkeys was deemed rather high.

Pullorum disease, its nature and its control, H. J. STAFSETH and C. W. DARBY (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 282-291).—This is a discussion of the nature of pullorum disease, diagnostic methods, and control and eradication measures.

Studies in pullorum disease.—V, Efficiency of homologous and heterologous antigens in detecting reacting birds in a variant-infected flock, R. GWATKIN (*Canad. Jour. Comp. Med. and Vet. Sci.*, 9 (1945), No. 7, pp. 183-191).—Continuing this series (E. S. R., 93, pp. 198, 626), when 338 chicks were infected by mouth with a suspension of organs of infected chicks, 59 died and *Salmonella pullorum* was recovered from 34. During an outbreak of coccidiosis, 26 birds died, and *S. pullorum* was recovered from 3 of 10 positive and 2 of 15 negative birds. In a group of 30 pullets, of which 17 were positive, 2 questionable, and 11 negative, 9 of the positive group yielded *S. pullorum*.

Examination of 125 mature birds yielded *S. pullorum* from 43 of 54 positives, from 5 of the 7 questionable reactors, and from 12 of the 64 birds which were negative in 1:50. Some of these were negative in dilutions of 1:10 upwards.

while others gave complete agglutination in 1:10 and 1:20 with variant antigen but were negative with the regular strains. In 4 cases, 2 positive and 2 negative, *S. pullorum* was recovered from the thymus gland only.

The flock was divided when the birds were 5.5 mo. old. Had regular antigen only been employed, 49.2 percent of the reactors would have been missed. On the first test following the division, 10 reactors were removed and *S. pullorum* was recovered from 7. On the second test, 3 reactors were removed from the negative group, and the regular antigen failed to detect the only one of the three from which *S. pullorum* was recovered. The third test, when the birds were 10 mo. old, was negative. On the fourth test, at 1 yr., one bird reacted with variant but not regular antigen. Another showed a trace of reaction and was negative on necropsy.

Three lots of eggs from each group were hatched. In the first, 12 percent of the negative chicks died and none yielded the organism on culture. Of the positive group, 84 percent died, and *S. pullorum* was recovered from all. In the second hatch, 12 percent of the negative and 42 percent of the positive chicks died. *S. pullorum* was not recovered from any of the former but from 80 percent of the latter. Ten percent of the negative and 93 percent of the positive chicks died in the third hatch. No recovery of the organism was made in the former, but it was isolated from 91 percent of the latter.

Studies in pullorum disease.—VI, Comparison of whole blood and tube tests with regular and variant antigen and a combination of the two antigens, R. GWATKIN (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 8, pp. 216-223).—Continuing the series noted above, a comparison of whole blood and tube tests on variant-infected birds showed an agreement of 96.5 and 97.3 percent on two groups of 866 and 570 birds, respectively. Variant antigen was more efficient in detecting variant-infected birds than regular antigen. The whole blood test with regular antigen detected more of the variant-infected birds than the tube method with antigen prepared from regular strains.

Comparison of variant, regular, and mixed whole blood antigens on 1,391 birds (746 variant and 645 regular) showed an agreement of 99.4 percent between the variant and mixed whole blood results, and 96.8 percent between the regular and mixed whole blood tests.

Pullorum and paratyphoid in North Dakota turkeys, D. F. EVELETH, J. O. FOSS, and C. I. NELSON (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 6, pp. 9-12).—Cases discovered in five flocks are described, together with studies of methods of detecting agglutinins or *Salmonella pullorum* in whole blood and serum and the isolation and identification of organisms obtained from poults and mature turkeys. The serum plate test with the reading at 5 min. is recommended for the detection of pullorum disease, which is not widespread in North Dakota turkeys. Paratyphoid infections and navel ill are responsible for greater losses, and it is suggested that an effort be made to decrease the incidence of paratyphoid infection by means of a testing and elimination program. Some of the factors responsible for reactions to the pullorum test are discussed.

An outbreak of leucocytozoon disease in turkeys, A. SAVAGE and J. M. ISA (*Cornell Vet.*, 35 (1945), No. 3, pp. 270-272, illus. 8).—A case report involving losses of approximately 5,000 out of 8,000 birds on an island in Manitoba.

AGRICULTURAL ENGINEERING

Farm irrigation structures, C. N. JOHNSTON (*California Sta. Cir.* 362 (1945), pp. 59, illus. 58).—The author presents a summarized discussion of design and installation procedure for farm irrigation structures. In order to avoid confusion, irrigation structures are described by their design details and not particularly by

name, and these structures are presented in the following order: (1) Open channels such as canals or ditches, (2) ditch or canal structures and supplemental equipment, (3) pipe lines, and (4) control devices in pipe lines. Laws that govern flow in canals and ditches are discussed. Examples of economical design in the range of structural materials for ditch or canal structures are presented to enable selection of the unit according to needs. The points of superiority of pipe lines over ditches, together with their shortcomings, are shown by comparison to aid in deciding the type of carrier system to install. Discussion of pipe-line control devices covers the aids needed to make a pipe line work efficiently.

Surface water supply of Hawaii, July 1, 1941, to June 30, 1942 (*U. S. Geol. Survey, Water-Supply Paper 965* (1945), pp. 134+).—This paper records measurements of the flow of streams and ditches in the Territory.

Flow of liquids through vertical circular orifices and triangular weirs, F. W. GREVE (*Purdue Engin. Expt. Sta. Res. Ser. 95* (1945), pp. 68+, illus. 18).—The author reports the results of a series of investigations made of free discharge of several different liquids from circular orifices and triangular weirs in an effort to determine any dependency of the discharge coefficient upon both the Reynolds and the Weber numbers. A detailed outline of the investigations made, together with a description of the apparatus used, the method of testing, and the results obtained, is presented.

As to flow through circular orifices, (a) no definite correlation between the coefficient of discharge and either the Reynolds or the Weber number was obtained, (b) the critical, or maximal, discharge coefficient varied less than 2 percent for a given orifice, irrespective of the liquid issuing therefrom, (c) the critical discharge coefficient varied inversely with the diameter of orifice, (d) the critical discharge coefficient occurred at a critical head, which head was dependent upon the diameter of the orifice and the kinematic viscosity of the liquid, and (e) the critical head for all orifices was a minimum when the kinematic viscosity of the liquid was approximately 0.00003 sf/s. For triangular weirs, (a) the coefficient of discharge decreased with increase in head, (b) the data were insufficient as concerns a possible relation between the discharge coefficient and the Reynolds number, and (c) the surface tension of a liquid, and hence the Weber number as herein defined, did not affect the discharge coefficient.

The bonding action of clays.—I, Clays in green molding sand, R. F. GRIM and F. L. CUTHBERT (*Ill. Engin. Expt. Sta. Bul. 357* (1945), pp. 64, illus. 20; also *Ill. State Geol. Survey Rpt. Invest. 102* (1945), pp. 55+, illus. 20).—In order to obtain a better understanding of the properties of molding sands and rebonding clays this project, cooperative with an Illinois clay products company, was set up. The objects of the study were: (1) To gain an understanding of the bonding action of clays; (2) to evaluate the bonding properties of the various clay minerals and their durability; (3) to determine to what extent and how bonding clays can be improved by the use of beneficiating substances commonly used for that purpose; (4) to determine whether or not new and better bonding materials could be developed and what are their specific properties and limitations; and (5) to improve mold making practices which would have the advantages of lowering the costs, reducing defective castings, increasing production, and producing better castings. This paper presents certain results which have to do with green sand, namely: (1) A fundamental classification of bonding clays, based on the mineral components of clays which are largely responsible for their bonding action; (2) a description of the green compression strength and bulk density properties that are characteristic of each class of bonding clays; (3) a theory of the bonding action of clays in green sands; and (4) an explanation of the variation of bulk density in green sands.

Old army truck made into farm machine that bucks hay and loads manure, dirt. W. P. KINTZLEY (*Colo. Farm Bul.* [*Colorado Sta.*], 6 (1944), No. 6, pp. 6-9, illus. 5).—A newly developed all-purpose farm loading operations machine with easily changed attachments is described. Examples of the machine's operating performance for various farm jobs are given, citing savings in time and labor.

Some things to be desired in the development of spraying and dusting machinery. E. G. MCKIBBEN ET AL. (*Mich. State Col.*). (*Mich. State Hort. Soc. Ann. Rpt.*, 74 (1944), pp. 41-53).—A panel discussion.

Vacuum-type harvester for white clover seed. S. T. DEXTER and E. G. MCKIBBEN (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 294-297, illus. 3).—A report on preliminary trials of an experimental harvester utilizing the vacuum principle in operation. Results indicate a very definite possibility for the development of effective harvesting equipment for white clover, Ladino clover, and other forage and grass seeds by the proper combination of a beating mechanism and a suction nozzle.

Threshing of grass, root, and vegetable seed crops ([*Gt. Brit*] *Min. Agr. and Fisheries Bul.* 130 (1945), pp. 20+, illus. 4).—A presentation of descriptions, operating instructions, and suggested adjustments of machines for threshing operations in seed production. A separate discussion is given for the following: (1) The corn thresher, (2) threshing of grass seeds, (3) the clover huller and hulling attachments, (4) threshing of timothy, (5) combine harvesting of seed crops, (6) conditioning, (7) weed impurities in grass and clover seed crops, (8) root and vegetable seeds, and (9) dressing of seeds.

Mechanical harvesting of cotton. H. DUNLAVY and I. M. PARROTT (*Oklahoma Sta. Bul.* 286 (1945), pp. 20, illus. 9).—The authors give the results of a limited study of mechanical harvesting of cotton in which six comparative lots of hand and mechanically harvested cotton were analyzed. Calculations of field data to determine the difference in value of the hand and mechanically harvested bales after deduction of the cost of picking and ginning are presented in tabular form. From these tests indications were that: (1) As an average the machine-harvested required 145 lb. less bur cotton to make a bale than did the hand-harvested, and lint turnout was as high or higher in five of the six lots; (2) average grades of hand-harvested and mechanical-harvested cotton were practically the same, and lint from the machine-harvested was 11 ct. per hundred higher than that of hand-harvested; (3) harvesting costs per bale were \$24.82 less by machine than by hand; hand-harvesting costs represented 41.3 percent of the gross value of the cotton, while machine-harvested was only 7.4 percent; and (4) the gross value of the bales from the two methods of harvesting was approximately the same because of no material differences in grades; however, machine-harvested bales gave 73.5 percent greater net value than the hand-harvested bales, or an additional money value of \$26.02. An analytical report is also given of the results of a demonstration of mechanical harvesting as compared with hand harvesting, held near Anadarko, Okla. In this demonstration the following machines were used: (1) John Deere stripper without extractor, (2) modified Texas type (Cohea) machine with extractor, (3) Allis-Chalmers converted grain combine, and (4) low drum International picker.

Standard-density cotton-gin presses. C. A. BENNETT, J. E. HARMOND, and C. S. SHAW (*U. S. Dept. Agr. Cir.* 733 (1945), pp. 16, illus. 10).—A presentation of information developed through tests made on uppressing presses concerning (1) the engineering problems involved in producing higher density bales at cotton gins without a broad departure from existing conditions and equipment or great expense for new machinery, and (2) the mechanical elements of cotton-gin press construction to meet bale packaging requirements for standard-density domestic shipment and consumption and to permit satisfactory recompression of bales to high density for export. The general requirements and specifications for standard-density gin presses with their auxiliary equipment is given, together with a discussion of field

conversion of low-density gin presses for standard-density service. The authors state that although the information presented was developed through tests made on uppressing presses, which represented 11,522, or 88 percent, of the gin presses in the United States in 1940, the findings should also be applicable to the 12 percent of downpressing presses.

Mow drying of hay, S. T. DEXTER and W. H. SHELDON (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 365-370, illus. 4).—The authors report on the experimental procedures of blower and tunnel construction in the barn mow and the harvesting, mowing, and resulting curing of a mixture of alfalfa and smooth bromegrass for hay. As a whole the hay was of excellent quality, indicating that such a system of curing hay may have great possibilities in Michigan, as it saves the leaves, speeds up operations, and takes much of the uncertainty out of hay making.

How to control bin dryers, G. J. BOUYOUKOS and R. E. MARSHALL. (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 7, pp. 96-98, illus. 7).—Through the use of two thermometers, one in the incoming air stream and another in the exhaust air, the drying progress of dehydrated products can be measured. The authors illustrate and discuss good and bad bin dryer designs. Investigations of bins of good design indicate that hot air must be supplied at a rate of not less than 7,500 cu. ft. per minute, or a velocity of 2,500 ft. per minute. Air velocity and temperature measurements will indicate whether the dryer is efficient.

An inexpensive home-made beeswax press, R. H. KELLY and W. SHELDON (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 292-293, illus. 2).—A simple inexpensive device for rendering beeswax is described and the procedure for its use is discussed.

Farm buildings from home-grown timber in the South, W. K. WILLIAMS (*U. S. Dept. Agr., Farmers' Bul.* 1975 (1945), pp. 18+, illus. 21).—A general discussion of the farm building situation in the South together with representative examples of what certain farm communities and individuals have done to provide themselves with improved farm houses and buildings through the utilization of the products of the homestead timber lot. The author points out that ordinarily portable or stationary sawmill operations will do custom sawing for a moderate charge or on a toll basis, taking part of the lumber as payment. This may result in net savings up to two-thirds of the total lumber costs for a structure. Suggestions for curing of green lumber are given, together with a tabulation of uses of southern woods in farm buildings.

Insulation for farm buildings, W. J. PROMERSBERGER (*North Dakota Sta. Bul.* 336 (1945), pp. 14, illus. 10).—This continues and enlarges Bulletin 325 (F. S. R., 90, p. 255) in which a practical discussion is given of the purpose of insulation, together with suggested farm products which can be used as insulating materials and their installation in farm buildings. A tabular listing of the insulating values of several types of common constructions is given.

Ventilating Red River Valley potato storage structures, A. D. EDGAR and T. F. LONG (*North Dakota Sta. Cir.* 72 (1944), pp. 8, illus. 10).—A report of ventilating system research studies made on potato storage structures. Two air circulation methods, direct or "through circulation" and indirect or "shell circulation," are presented. The adaptation of forced air conveyance to the storage structure through use of a ventilating fan with automatic thermostatic control is described and discussed.

Approved milking parlors for the State of Washington, H. A. BENDIXEN and I. J. SMITH (*Washington Sta. Bul.* 461 (1945), pp. 39, illus. about 25).—The applied term "milking parlor" refers to a relatively small, well-lighted room where cows, one string at a time, are held only during milking. They may be fed grain there

but no hay or silage. This latter feed is provided elsewhere outside the milking parlor. In order to aid dairy producers, who contemplate a building program in structural improvement to their dairy plant, the authors present and discuss the following phases to the project: (1) Types and advantages of milking parlors; (2) location of yards, loafing sheds, and milking parlors; (3) size of milking parlors; (4) arrangement of milking parlors, feed rooms, and milk houses; (5) foundations, walls, and ceilings; (6) lighting; (7) electrical outlets and wiring; (8) screening; (9) ventilation; (10) roof construction and framing; (11) floor construction, managers, stanchions, stalls, and gutters; (12) a recommended procedure for actual floor construction; (13) walk-through milking parlors with elevated stalls; and (14) bills of materials. The following additional comments are further given: Although the plans shown in this bulletin have the approval of the Division of Dairy and Livestock of the State Department of Agriculture and of the State Department of Health, dairy operators, however, are urged to always confer with their dairy inspectors before starting construction, because in many cases variations in the plans presented in this bulletin may be desirable to fit local conditions.

Dangers of the home-built electric fence controller, D. E. WIAIT (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 261-265, illus. 2).—A dissertation showing how and why the use of the home-built 110-v. 60-cycle a. c. electric fence controller is dangerous through possible electrocution of animals and humans.

AGRICULTURAL ECONOMICS

What peace can mean to American farmers: Maintenance of full employment (*U. S. Dept. Agr., Misc. Pub.* 570 (1945), pp. 28+).—This second publication of the series (E. S. R., 93, p. 632) discusses the assisting of private enterprise to maintain full employment by the maintenance of farm purchasing power, revision of tax laws, encouragement of competition, stimulation of private investment, revision of the social security system, and improvement in the timing and coordination of public expenditures. It also discusses the appropriate types of public expenditures and the management of the Federal debt.

Current Farm Economics [August 1945] (*Cur. Farm Econ. [Oklahoma Sta.]*, 18 (1945), No. 4, pp. 73-89+).—In addition to the usual reviews of the general agricultural and price situation and the situations for crops and livestock, an article, **Farm Mortgages and Farm Mortgage Debt Retirement in Oklahoma**, by R. T. Klemme (pp. 82-86), is included, with tables showing by years, 1941-44, inclusive, the percentage distribution of land transfers by type of payment; percentage distribution of credit extended by types of lender; average mortgage indebtedness per mortgaged acre, owner's equity, and average sales price of mortgaged land; estimated acreage mortgaged and mortgage debt created; and estimated new mortgage debt, debt retirement, and total mortgage debt (1941-45).

[Economic studies] (*North Dakota Sta. Bimo. Bul.*, 7 (1945), No. 6, pp. 13-15, 27-29).—Included are **Land Market Activity in North Dakota—First Quarter, 1945**, by R. L. Berger and R. Engelking (coop. U. S. D. A.); and **North Dakota Farm Prices**, by P. V. Hemphill.

Farm real estate situation in five areas of Tennessee, 1941-1944, B. H. LUEBKE, A. H. CHAMBERS, and M. B. JOHNSON. (Coop. U. S. D. A.). (*Tennessee Sta. Agr. Econ. and Rural Sociol. Dept. Monoq.* 185 (1945), pp. 52+, illus. 35).—Data were collected for Jefferson, Rutherford, Haywood, Cumberland, and Humphreys Counties. The volume, acreage, etc., of transfers and seasonal distribution of sales; the resales, including rate of turnover and prices; size of farms transferred, all tracts, and by types of buyer and seller and types of financing; price per acre; extent and types of financing, and types of lenders; and types of sellers and buyers are discussed.

The rate of real estate turnover in the five counties increased from an average of 85.3 per 1,000 farms in 1941 to 116.9 in 1944. Approximately 12 percent of all sales in 1944 represented resales of tracts held for less than 24 mo. The size of tracts sold decreased each year. Price per acre increased 68.3 percent from 1941 to 1944. Fifty-seven percent of the land sold in 1944 was paid for in cash. Mortgaged transfers sold for \$19.48 more per acre than cash sales. Tenant buying increased from 8 percent of all purchases in 1942 to 13 percent in 1944. Individuals were the principal source of mortgage credit on farms sold in 1944.

Better farm leases, M. D. HARRIS, M. M. THARP, and H. A. TURNER (*U. S. Dept. Agr., Farmers' Bul. 1969 (1945), pp. 41+*, illus. 2).—Some of the general principles applicable to all rental situations are outlined and explained in general terms. Included also is a check list of points that need to be discussed by the contracting parties to a lease and a Flexible Livestock-Share Lease form prepared by the Department to illustrate the general form and content of a lease. This publication supersedes Farmers' Bulletin 1164 (E. S. R., 44, p. 290).

Arizona agriculture, 1945: Production, income, and costs, G. W. BARR (*Arizona Sta. Bul. 194 (1945), pp. 15+*, illus. 7).—This continuation of the series (E. S. R., 91, p. 83) discusses the production, costs, and income from different crops and kinds of livestock, with tables and charts showing the cash income 1943, 1944, and the average 1934-43 for different products; indexes 1940-44 of the prices of barley, grade A milk, upland cotton, alfalfa, top fat steers, and wool; prices of different agricultural products December 1943 and December 1944 and average December prices 1934-43; and calculated costs in 1945 per acre of producing upland cotton, alfalfa, and barley and grain sorghums under the single-crop plan in the Salt River Valley Water Users' area. Other charts show the relation of sale price of crops to sale price of land the year following, and acreages of American-Egyptian cotton, upland cotton, alfalfa, winter grains, commercial truck crops, flax and sugar beets, and tree fruits and nuts irrigated in five counties by years 1929-44.

Suggested adjustments in Kansas agriculture for 1946. (Coop. U. S. D. A.). (*Kansas Sta., Agr. Econ. Rpt. 27 (1945), pp. 46+*, illus. 1).—Recommended adjustments in crops and livestock are discussed. The analysis is intended to furnish a basis for developing production goals and a guide to formulating action programs for attaining the desired production.

Wartime growth and decline of hog production in the northern Idaho cash-grain area, P. A. EKE (*Idaho Sta. Bul. 263 (1944), pp. 12*, illus. 4).—Records of the community hog pool at Moscow, Idaho, for 1941-44, inclusive, were analyzed.

Some of the findings were: Number of hogs increased about 50 percent over 1941 in 1942 and 1943, but about two-thirds of the increase was lost in 1944. Nearly all members of the pool marketed one or more hogs from July 19, 1942, to October 18, 1943; about 50 percent sold less than 14 top hogs; and less than 8 percent, 56 hogs. Number of top hogs sold per 100 acres of cropland ranged from an average of 4.7 for members with 800 or more acres to 94 for members with less than 50 acres of cropland. Average weight of top hogs increased from 206 lb. in 1941 to 217 lb. in 1943 and 1944. "For the future any permanent expansion in the hog enterprise on the farms of this cash-grain area will rest upon wheat continuing over a period of years at or near corn belt feed-grain prices. A willingness of more farmers to change to year around employment in caring for livestock is also essential."

Financial position of a representative group of McHenry County farmers in the dairy region of northern Illinois, 1940-1942, B. D. PARRISH and L. J. NORTON (*Illinois Sta. Bul. 512 (1945), pp. 521-592*, illus. 10).—The basic data were collected by the survey method from 124 farms in 1940, 146 in 1941, and 118 in 1942, and included from 43 to 51 owners, 14 to 18 part owners, and 57 to 79 tenants in the different years. The capital position of operators, cash income and expense patterns, possibilities of buying farms from earnings, characteristics of farms and

operators, changes in milk production, total farm business, kinds of credit and how used, and factors influencing farm earnings are analyzed and discussed.

The findings are briefly summarized by the authors as follows: "Credit was widely used in 1940-42 by this group of McHenry County farmers, and apparently it was readily available. All tenure groups—owners, part owners, and tenants—were increasing their assets during this period; and owners were cutting down their debts. By 1942, tenants also were tending to reduce their debts, and all groups were adding to their holdings of cash. The owners of the larger farms were somewhat more heavily in debt during this period, but they were making more rapid financial progress than the owners of the smaller farms. The more heavily indebted tenants operated smaller businesses than the less heavily indebted tenants, but they were younger men and made considerable financial progress. In this period of rising incomes it paid these farmers to operate on the largest possible scale and to borrow, if necessary, to get the needed capital. Expansion in the farm business was largely accomplished by milking more cows and increasing the production per cow. By 1941, a few tenants were beginning to put cash earnings into the purchase of land."

Use of labor on Maine farms with dairy cows, G. F. Dow (*Maine Sta. Bul. 436* (1945), pp. 401-458+, illus. 5.).—"The purpose of this study is to present information concerning the farm labor supply and some of the more important methods of saving work and utilizing labor more efficiently. Facts are included concerning the amount and kinds of farm labor employed, age and ability of workers, seasonal demands for labor, prevailing wage rates, turnover in the labor supply, sources of day laborers, and factors affecting labor efficiency." Most of the data were obtained from a survey made in 1943 that included 500 farmers keeping dairy cows in five selected areas of the State. Other information used was obtained from 989 dairy farmers in surveys made during 1928-37, inclusive.

Some of the findings were: The average amount of labor was about 22 mo. per farm annually, of which, in 1942-43, the operator contributed 49 percent, his family 31 percent, and labor hired by the month or year 15 percent and by the day 5 percent. Labor was hired by 70 percent of the farmers. In 1943, women and girls accounted for about 12 percent of all labor, including 14 percent of the family labor, 1 percent of the hired monthly or annual help, and 11 percent of the hired day help. The average ability of laborers to do a full day's work was 90 percent for men and boys and 76 percent for women and girls. The percentages for different ages were: Children under 14 yr., 50; boys 14-17 yr., 88; men 18-54 yr., 99; and men 65 yr. or older, 68. In spite of a 0.65 percent decrease in the working ability of farm labor and 1.8 percent decrease in the months of labor used during 1942-43, there was a net increase of about 5 percent in the production of crops and livestock. Increase in output per month of labor was 8.1 percent. Wage rates on dairy farms had lagged behind those on potato and poultry farms. Dairymen with the most efficient use of labor averaged 1.7 men and 14.4 cows per farm, and had a labor income of \$394 per farm, as compared with 1.8 men, 6.6 cows, and —\$406 for the farms making the least efficient use of labor. Farms with highest crop yields and largest milk production per cow produced 70 percent more food per man and had a labor income of \$330, as compared with —\$305 for the least productive farmers. Farmers who also had other farm business used labor more efficiently and had larger labor income than those specializing in dairying. Operators 65 yr. old or older averaged 186 man-work units per man, as compared with 236 units for operators under 40 ~~yr. of age.~~

Size of loads and delivery costs for labor in milk distribution in Boston and Portland, G. F. Dow (*Maine Sta. Bul. 437* (1945), pp. 459-490+).—This study of the effect of wartime practices upon the size of loads and the trend in delivery costs is based upon surveys in Portland of each of the four largest distributors and in Boston of each of the eight largest distributors representing more than two-

thirds of the total sales in that market. The wartime practices and trends in number of delivery routes and volume of dairy products sold from 1941 to 1944 are discussed. The size of loads, labor utilization, and delivery costs for labor on the retail and wholesale routes in the two cities in October 1944 are analyzed. The increase in delivery costs if return is made to prewar loads and other practices, consumer acceptance of every-other-day deliveries, and other wartime practices are discussed.

The volume of dairy products delivered per man increased 34 percent on retail routes in both cities from October 1941 to October 1944. The labor efficiency on wholesale routes increased 4 percent in Boston and 35 percent in Portland. Increase in the efficiency of the use of delivery labor was nearly sufficient to offset the increase in wage rates, which was 38 percent for retail route drivers in Boston and 41 percent in Portland. The net increase in delivery labor costs per point of product handled was only 4 percent for retail routes in Boston and 7 percent in Portland, and 11 percent and 1 percent, respectively, on wholesale routes. Under existing wage rates it is estimated that a return to daily deliveries and other prewar practices would result in an average increase on retail routes of 0.89 ct. per quart in Boston and 0.74 ct. in Portland. Motor truck costs would result in an additional 0.2 ct. per quart. The wartime practices that should be continued in the postwar period, as recommended by the Committee of Milk Distribution Efficiency of the Northeastern Dairy Conference, are: Every-other-day delivery to homes; no Sunday delivery to wholesale customers; no special deliveries or callbacks; daylight delivery on retail routes, except where congested daytime traffic makes this impractical; continued limitation on the number of different items carried on delivery routes; no pint containers to be used for retail milk sales; deposit charges on all glass bottles delivered to wholesale customers; and no return of milk and cream from stores.

Milk distribution in Providence, Rhode Island, E. J. LEBRUN and A. L. OWENS (*Rhode Island Sta. Bul.* 294 (1945), pp. 33, illus. 8).—The study was made to obtain the attitude of consumers and distributors toward possible changes in methods ultimately leading to more efficient milk distribution. It is based on a survey of 39 dairies handling one-half of the fluid milk sales in the market area, 196 retail food stores, and 4 percent of the families in the Providence metropolitan area during 1943–44. The families interviewed were served by 112 milk distributors. Some of the findings were:

About 85 percent of the families had all the milk used delivered at the home, 12 percent purchased it at retail stores, and 3 percent had part delivered and purchased part. Average daily consumption was 0.41 qt. per person and 1.7 qt. per family. Thirty-six percent of the families did not want limitations on number of dealers permitted in a specific section of the market. About four-fifths of the families wanted home deliveries continued and were not in favor of restricting sales to retail stores. Two-thirds of the stores could have handled more milk. All of the 39 distributors stated that every-other-day deliveries should be continued until the close of the war and 27 of them wanted such deliveries continued after the emergency. None favored zoning of distribution and 75 percent considered such a system impracticable.

Farmers' cooperative business organizations in Louisiana, B. M. GILE and J. M. BAKER (*Louisiana Sta. Bul.* 392 (1945) pp. 14, illus. 1).—The number, types, and nature of the business of the cooperative business organizations of farmers in 1944 are briefly discussed. The main part of the bulletin consists of tables showing the name, office locations, and nature of business of the five State or regional area units and by parishes of the 147 local associations.

Georgia farm prices, 1910–1943, G. B. STRONG, J. C. ELRON, and W. F. HENDRIX (*Georgia Sta. Bul.* 239 (1945), pp. 43, illus. 28).—Tables and charts are

included and discussed showing midmonthly prices by years of 28 agricultural products and milk cows, horses, and mules; the monthly indexes (August 1909–July 1914=100) of grains, cotton and cottonseed, dairy products, chickens and eggs, meat animals, fruits, and miscellaneous products, and all products; the average (1910–43 and 1930–39) seasonal variations in prices of the more important products; indexes of prices received for all farm commodities in Georgia and the United States; the prices paid by farmers in the United States; and the actual and adjusted prices of hogs and beef cattle in Georgia 1910–43.

Maine farm prices during world war periods, C. H. MERCHANT (*Maine Sta. Bul.* 435 (1945), pp. 293–399+, illus. 44).—The purpose of this publication is to point out the similarities and differences which have taken place in the Maine farm prices during the two world war periods. The agricultural situation—wholesale and farm prices, prices paid by farmers, farm wages, farm real estate values, farm taxes, and marketing and distribution costs—are discussed with tables and charts. Charts and tables are also included and discussed showing for both Maine and the United States the prices 1914–21 and 1939–44 of potatoes, apples, grain crops, hay, dry beans, milk cows, milk, butter, veal calves, beef cattle, chickens, eggs, sheep, lambs, wool, hogs, and horses. For the same products charts show purchasing power. The farm prices by types of Maine farming are discussed with charts showing the relation 1910–44 of the potato-, apple-, dairy-, and poultry-farm indexes to the index for wholesale prices of commodities in the United States.

Average prices received and prices paid by New Jersey farmers, 1910–1943, D. T. PITT (*N. J. Dept. Agr. Cir.* 351 (1944), pp. 94, illus. 3).—Tables show the average monthly prices 1910–43 of 25 important crops, hogs, veal calves, milk, eggs, and chickens; the relations of the prices (1935–39=100); the average prices paid by New Jersey farmers for dairy and poultry rations, farm labor, seeds, and plants; and the ratio of prices received by farmers to prices paid.

Crops and Markets [July 1945] (*U. S. Dept. Agr., Crops and Markets*, 22 (1945), No. 3, pp. 109–152, illus. 1).—Included are the usual data as to production and condition of crops, stocks of grain and hay on farms, farm employment, wage rates, prices received and paid by farmers, etc., and the usual market reports for different groups of products. A brief summary of net farm income and parity for 1944 includes tables showing per capita net income of persons on farms and not on farms, 1935–39 average, and by years, 1940–44, inclusive; cash receipts from farm marketings and cash receipts plus value of products consumed in farm households, by commodities, calendar years 1942–44; net income of persons on farms and not on farms, 1935–39 average, and by years, 1940–44, inclusive; index numbers of income, by years, 1940–44, inclusive; and cash receipts from farm marketings, value of products consumed in farm households, and government payments, by States, calendar years 1942, 1943, and 1944.

RURAL SOCIOLOGY

Farm and small town workers in metropolitan war industry: A sociological study of war migrants in Spokane, Washington, P. H. LANDIS and K. H. DAY (*Washington Sta. Bul.* 460 (1945), pp. 39, illus. 15).—From this study of war migrants in Spokane it was found that one-fourth of the families interviewed were uncertain whether they would remain in Spokane, 58 percent definitely planned to remain, and 17 percent intended to leave. Of 100 war workers' families of rural origin who definitely planned to leave Spokane, some 25 percent planned to return to the same job as before the war, 15 percent planned to take another job, 8 percent planned to buy a farm, 2 percent planned to go into business for themselves, and 50 percent were not sure of any particular job. Thirty-six percent of family

heads were over 40 yr. of age. The postwar outlook for rural migrants in war industry and their future depends almost entirely upon the ability of someone else to provide them with employment. Three alternatives seem to face Spokane, where war industry has greatly expanded the demand for labor: A greatly expanded postwar industrial development under private initiative; the expansion of municipal, State, and Federal employment through a public works program of major proportions; or a mass migration away from Spokane back to home communities. The third alternative will simply throw back on rural communities the major burden, making government subsidies and employment programs in rural areas as essential as in urban areas. The prospect for a high standard of living, however, in the Pacific Northwest is more favorable than that of many sections of the country where the pressure of population on resources has long been a major problem.

Agricultural history of Knox County, Tennessee.—I, From the beginning to 1860, H. J. BONSER, C. C. MANTLE, and C. E. ALLRED (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 186* (1945), pp. 27+).—A brief history of developments.

Differential fertility in Louisiana (*Louisiana Sta. Rpt. 1944*, pp. 127–128, *illus. 1*).—Among the more significant findings to date are the following: Rural areas of the State are producing far more than their proportionate share of Louisiana's future inhabitants. Within the rural portion of the State the more removed an area is from urban influences, the higher its rate of reproduction. The French and Catholic portions of Louisiana are characterized by much higher fertility ratios than Anglo-Saxon and Protestant Louisiana, this being true of both whites and Negroes among the urban, the rural-nonfarm, and the rural-farm populations. The delta cotton plantation sections of Louisiana have the lowest rates of reproduction of any of Louisiana's rural territory, very little above those in the urban centers. Negroes do not appear to be reproducing any more rapidly than whites, except that they still are slightly overrepresented in the farm population.

Health and mortality in Louisiana (*Louisiana Sta. Rpt. 1944*, pp. 128–131, *illus. 2*).—Diseases of the heart are found to be far ahead of all the causes of death in Louisiana, killing each year around 6,000 people at the rate of more than 250 per 100,000 population. Pneumonia and influenza, nephritis, cancer, diseases of the nervous system, tuberculosis, accidents other than those in which motor vehicles are involved, causes associated with premature birth, syphilis, and motor vehicle accidents are, in the order named, included among the 10 leading causes of death in the State, and collectively account for three-fourths of all deaths. Louisiana's farms enjoy a definite advantage over its towns and cities from the standpoint of health and longevity, both among whites and Negroes and in practically all age groups. Malaria, typhoid fever, whooping cough, diphtheria, and pellagra take a proportionately higher toll of life in rural than in urban areas. Louisiana Negroes have much higher mortality rates than whites, the racial differences being greatest in infancy and largely disappearing by age 65. Louisiana compares unfavorably with the nation in the control of transmissible diseases, with higher death rates among both whites and Negroes, rural and urban. Health in the State is improving rapidly, as in 1940 the mortality rates from pneumonia and influenza, tuberculosis, typhoid fever, malaria, diphtheria, and most other contagious diseases were only fractions of what they were in 1920. The saving in life achieved during this period was much greater, relatively, among the Negro than among the white population of the State, and for nearly all of the important causes of death, the rates for the two races were much nearer one another at the close of the period than they were at the beginning.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Training at the professional level for statistical work in agriculture and biology. W. G. COCHRAN. (Iowa State Col.). (*Jour. Amer. Statis. Assoc.*, 40 (1945), No. 230, pp. 160-166).—This paper "attempts to outline the kind of training that may appropriately be given by colleges and universities for statistical work at a professional level in agriculture and biology."

The author concluded that "although at present the teaching of statistics to agricultural and biological students must be carried out at a low mathematical level, it is possible with experience and ingenuity to make clear not only the computational processes but also the nature of statistical reasoning and the limitations of statistical technics. The primary obstacle to an improvement in the quality of such teaching is the dearth of teachers who are keenly interested in statistics and have the leisure and ability to follow the advances in statistical theory."

"For the would-be professional statisticians, the training should include mathematics, mathematical and applied statistics, and some broad, fundamental courses from the applied field which the student selects. The training should be sufficiently flexible to cope with aspirants from both the mathematical and biological fields and should culminate in the conduct of research."

Farmers of the world: The development of agricultural extension, edited by E. deS. BRUNNER, I. T. SANDERS, and D. ENSMINGER. (*New York: Columbia Univ. Press*, 1945, pp. 208+)—"The primary aim of this book is to discuss the most effective general approach which a government or a private agency can use in helping rural people solve their everyday problems." Included are chapters as follows: What Extension Is, by D. Ensminger and I. T. Sanders (pp. 1-7) (Univ. Ky.); Diversity and Change in the Culture of Nonliterate Peoples, by S. T. Kimball (pp. 8-18); Extension Work in the Pacific Islands, by F. M. Keesing (pp. 19-36); Characteristics of Peasant Societies, by I. T. Sanders (pp. 37-45) (Univ. Ky.); Promoting Cooperative Agricultural Extension Service in China, by H.-P. Yang (pp. 46-60); Extension Experience in India, by D. S. Hatch (pp. 61-77); Extension Work Among the Arab Fellahin, by A. I. Tannous (pp. 78-100); Extension in the Balkans, by C. E. Whipple (pp. 101-116) (U. S. D. A.); Extension Work in Latin America, by C. P. Loomis (pp. 117-137) (Mich. State Col.); Euro-American Rural Society, by C. C. Zimmerman (pp. 138-152); Extension in the United Kingdom, by R. Rae (pp. 153-164); Agricultural Extension Services in Northwest Europe, by P. L. Yates and L. A. H. Pieters (pp. 165-179); Agricultural Extension in the United States, by E. deS. Brunner and C. B. Smith (pp. 180-192); and The Role of Extension in World Reconstruction, by M. L. Wilson (U. S. D. A.) and E. deS. Brunner (pp. 193-199).

Forestry in vocational agriculture, H. C. GROSECLOSE (*Va. Polytech. Inst. Bul.*, 38 (1945), No. 10, pp. 75, over 50 illus).—The several chapters deal with why study farm forestry, forestry as an enterprise for the student of vocational agriculture, forest protection, trees of economic importance, how trees grow, silviculture, renewing the forest, measuring the timber crop, and marketing.

FOODS—HUMAN NUTRITION

Composition and nutritive value of pork as related to weights of animals and cuts, O. G. HANKINS and N. R. ELLIS (*U. S. Dept. Agr. Cir.* 731 (1945), pp. 22, illus. 13).—The study provided data on composition and certain nutritive properties of pork from 64 representative hogs of intermediate type and weighing from 175 to 250 lb., facilitating (1) determination of desired weights and degrees of finish, (2) estimation of weights of cuts from hogs of various market weights, (3) calculation of food value of different cuts from hogs of various weights, and (4) determination of physical and chemical composition of cuts for dietary purposes.

As the weight of hog became greater, the weight increases of ham, shoulder, bacon, and back fat were about equal, whereas that of loin was less. However, the difference between total weight and the weight of edible meat of the dressed carcass or primary cuts varied little. This resulted in an increase in the proportion of edible meat, and two 250-lb. hogs furnished practically the same quantity of edible carcass meat as three 175-lb. hogs. In separable fat content, bacon and the entire dressed carcass increased at about the same rate with increasing weight of hogs. The rate of increase for loin was small. In general, loin contained the highest proportion of lean; head the lowest. Ham, shoulder, carcass, and bacon were intermediate, in decreasing order as mentioned. Five 175-lb. hogs produced about as much lean as four 250-lb. hogs. Bacon yielded the highest proportion of edible meat, with ham, shoulder, carcass, loin, spareribs, head, and shoulder ribs following in order. In supplying calories, the cuts ranked from high to low in the order of back fat, bacon, shoulder, ham, and loin. Caloric value per pound for a certain cut varied with weight of hog. Loin and ham produced the most protein, and back fat the least, per pound of product. All cuts decreased in this constituent with increase in hog weight. Based on past experience and the information presented, it is thought that it should be possible for purchasers of pork products through their future selections to influence the more general production of hogs yielding cuts of the weights and fatness commonly preferred.

The choline and pyridoxine content of meats, J. M. MCINTIRE, B. S. SCHWEIGERT, and C. A. ELVEHEIM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 28 (1944), No. 4, pp. 219-223).—Continuing their studies on the vitamin content of meat (E. S. R., 90, p. 565; 92, pp. 306, 446), the authors have determined choline by the method of Engel (E. S. R., 88, p. 433) and pyridoxine by a modification of the method of Atkin et al. (E. S. R., 90, p. 9) in a number of fresh, cooked, and commercially prepared meats. The pyridoxine values were compared with those found by Henderson et al. (E. S. R., 86, p. 427) and were considered to be in good agreement when allowance was made for the fact that the fat was trimmed from the meat in the earlier work. Fresh muscle meat of veal, lamb, pork, and beef gave average choline values ranging from 68 mg. per 100 gm. in beef round to 120 in ham. Average pyridoxine values for the same meats ranged from 0.22 mg. per 100 gm. in lamb sirloin chops to 0.41 in veal chops. Beef liver, tongue, heart, kidney, and brain showed choline values of 510, 108, 170, 262, and 410 mg. per 100 gm. and pyridoxine values of 0.71, 0.13, 0.29, 0.39, and 0.16 mg. per 100 gm., respectively. No loss of choline was found upon cooking, retention of 87 to 114 percent being observed. Considerable loss of pyridoxine was noted, retentions of only 14 to 42 percent being observed, with the best retention obtained in roasting. Curing of hams resulted in a 43 percent destruction of pyridoxine.

Out-of-date meat preparation rules, D. DICKINS (*Miss. Farm. Res. [Mississippi Sta.]*, 8 (1945), No. 8, p. 8).—A few out-of-date meat cooking rules, from a list of preparation rules which Mississippi homemakers reported their mothers had taught them, are presented and discussed briefly in the light of newer preparation methods dictated by modern research findings.

Packaging is means of preserving eggs; treatments within egg cartons are helpful, W. E. PYKE (*Colo. Farm. Bul. [Colorado Sta.]*, 7 (1945), No. 3, pp. 9-13, illus. 3).—Quality retention in eggs stored up to 40 days under various conditions was measured by the standardized cake volume test of Pyke and Johnson (E. S. R., 85, p. 846). The cake volume curves showed that eggs held in unsealed cartons in a refrigerator at 40° F. kept their quality better than those held in similar cartons held at room temperature (72°). Sealing the cartons with a moisture-proof plastic film so that the eggs' own atmosphere of moisture and CO₂ was maintained measurably increased the keeping quality at 72°; still greater

improvement was attained by increasing the CO_2 content of the storage atmosphere by sealing into the carton a soda and solid-acid mixture that gradually released CO_2 . With this latter treatment, egg quality was satisfactorily maintained even at a storage temperature of 102° . Opening the sealed packages a day or two before using the eggs caused them to come down to normal in their cooking behavior. In addition to the cake volume curves, photographs of representative specimens of eggs undergoing these treatments are presented as a record of their appearance after breaking. Mold growth, which became troublesome in eggs held in extensive storage in sealed glass jars or sealed carton could be prevented by use of a mold deterrent applied to the shell or impregnated in the wrap. Increased CO_2 in the storage atmosphere also prevented mold growth. It is pointed out that the general quality of eggs for the consumer could be improved by use of the improved package applied at the point of production promptly after the eggs are laid.

Influence of calcium and magnesium upon composition of Boston head lettuce, A. D. HOLMES and L. V. CROWLEY. (Mass. Expt. Sta.). (*Food Res.*, 9 (1944), No. 5, pp. 418-426).—Boston head lettuce, grown under identical conditions with the single exception of the amount and type of fertilizer used, was assayed when it had developed to the usual market condition. All outer leaves likely to be discarded or trimmed off before consumption were removed, and only the pale green lettuce heads were used. Water, carotene, riboflavin, calcium, iron, magnesium, and phosphorus were determined by standard chemical procedures. The results revealed that, for all practical purposes, supplementing magnesium or lime fertilization does not increase the amount of any of the constituents studied with the exception of magnesium. Added magnesium sulfate increased the magnesium content of lettuce when compared with lettuce grown in the control plot. In general, the use of lime as a supplementary fertilizer decreased the iron and magnesium contents of the lettuce. The average values per 100 gm. of fresh lettuce, for 16 samples grown on four different plots and sampled at four different dates, were as follows: Carotene 2.7 mg., riboflavin 0.08, calcium 24.0, iron 2.1, magnesium 13.2, and phosphorus 23.2 mg. The authors conclude that sufficient amounts of valuable minerals and vitamins are present to warrant the classification of lettuce as a "protective food." A comparison with other values found in the literature is made, and a list of 37 references is given.

Outline of suggested specifications for purchasing processed fruits and vegetables, P. M. WILLIAMS (*U. S. Dept. Agr., Misc. Pub. 565* (1945), pp. 18, illus. 2).—This outline has been developed for those who formulate specifications used in obtaining supplies for institutions or other agencies. It is pointed out that grade or quality is one of the most important considerations in any specification and that, following selection of the grade to meet the particular requirements, any appropriate specifications may be indicated, as for example desired style of product, type of product, size and kind of container, drained weight, count or size, and packing medium. U. S. Grades A (fancy), B (extra standard), and C (standard) are defined, and specific examples are given to show how the specifications for purchasing processed fruits and vegetables should be written. Commodities for which quality grades have been formulated are listed, together with an indication of the grades available and of the other specifications which should be noted for each commodity in order to give a detailed description of the product required. Detailed suggestions are also given covering provisions for bid samples, final inspection of deliveries, acceptance or rejection of merchandise, contractor's responsibility, reservations, and payments and discounts.

Differences in the composition of the fruits of Cucurbita varieties at different ages in relation to culinary use, C. W. CULPEPPER and H. H. MOON. (*U. S. D. A.*). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 3, pp. 111-136, illus. 11).—

Thirty-six varieties of pumpkin and winter squash were grown at the Arlington Experiment Farm for one to four seasons and determinations of total and soluble solids, total and reducing sugars, acid-hydrolyzable polysaccharides, total and nitrate nitrogen, tannins, and acidity were made at intervals during growth and development of the fruit and its subsequent storage. Cooking and canning tests were made to determine the comparative value of the varieties for culinary purposes. Sugars and acid-hydrolyzable polysaccharides were the constituents most important in determining culinary value; these constituents also varied more widely than others, both within the variety at different ages and between the varieties. Varieties did not differ in composition to the same extent at all ages; some became high in acid-hydrolyzable polysaccharides at full maturity while others remained low throughout their life. Those high in acid-hydrolyzable polysaccharides at maturity subsequently became high in sugars during storage as a result of conversion of starch to sugar. Differences in nitrate nitrogen content were important in some cases because of the effect of nitrate upon the corrosion of the tin can. Differences between varieties in total and insoluble solids were quite similar to the differences in acid-hydrolyzable polysaccharides, and differences in soluble solids were also somewhat similar to those between sugars. The color, flavor, and texture of the cooked products varied widely and more or less independently among the varieties. Those having deep yellow color, mild flavor, and a heavy consistency were generally preferred.

Size of apples in relation to yields of pulp for sauce, W. F. ROBERTSON (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 4, pp. 386-389).—Twelve-lb. lots of apples of three size grades from each of five varieties were selected from commercial shipments for the preparation of apple sauce. The procedure involved hand trimming to remove the blossom end and any bruised spots, slicing into three transverse sections, boiling in a steam-jacketed kettle for 7 min., using 4 lb. of water with the slices from each 12-lb. lot of apples, followed by steeping for an additional 5 to 10 min., and pulping through a laboratory-size pulper to remove seeds, seed cells, stems, and skins.

The three size grades, 2, 2¼, and 2½ in. diameter, all yielded practically the same weight of trimmings (0.21 to 0.29 lb.) and amount of pulp (12.7 to 13 lb.), and required, respectively, 13.4, 10.0, and 8.2 min., exclusive of washing time, to prepare them for cooking. Since yields were the same and differences in preparation time of no practical significance, the small size fruits are considered as satisfactory as the medium size fruits from the preparation standpoint, and the more to be recommended since the usual price differential for small apples makes them more economical for use in making apple sauce.

Botulism and home canning, W. B. ESSELEN, JR. (*Massachusetts Sta. Bul.* 426 (1945), pp. 28, illus. 1).—This bulletin, prepared in the interest of answering some of the questions which have been raised concerning botulism in home-canned foods, presents a well-rounded review of the information available. This review covers a definition of botulism; a brief account of the important symptoms on which diagnosis is based; citation of typical cases of botulism from home-canned foods; and a list of all the important outbreaks of botulism from 1910 to 1944, with information as to location of the outbreaks, number of cases and deaths involved, and the kind of home-canned food responsible. Other points discussed include occurrence of the organism *Clostridium botulinum*; properties of the toxin produced; factors that influence the growth of the organism; heat resistance of the organism; adequacy of home-canning processing times as recommended at present; and attitude of the U. S. Department of Agriculture and food technologists toward home canning and botulism. An 18-point summary makes clear that botulinum organisms are widely distributed in nature and are apparently not confined to certain geographical areas, so that canning technics employed in any region should

be adequate to destroy chance spores of the organism. For nonacid foods, adequate sterilization is insured only by the use of a pressure canner in good operation. No nonacid foods canned without a pressure canner, or in a pressure canner incorrectly used, should ever be tasted until they have been boiled for 10 to 20 min.

Preserving food in home frozen food cabinets, G. A. FILINGER (*Kansas Sta. Cir.* 230 (1945), pp. 28, *illus.* 10).—This circular, intended as an aid to prospective buyers in the selection of home cabinets, presents some of the advantages and disadvantages of home frozen-food preservation, notes the types of cabinets available, and discusses the points to be considered in selecting the type of unit to buy. Brief explanation is given concerning the care for and economical management of such a unit, including a schedule of changes of food in the home cabinet, and instructions are given on the processing and storage of foods frozen in commercial locker plants or in home units; various fresh fruits and vegetables, meats, eggs, butter, and miscellaneous precooked foods are considered.

Cobalt content of some food plants, C. HURWITZ and K. C. BEESON. (U. S. D. A.). (*Food Res.*, 9 (1944), No. 5, pp. 348-357).—Significant differences in the cobalt content of various vegetables obtained from widely separated localities in the United States were observed. Spinach, with an average value of 0.67 p. p. m., showed considerably higher amounts of cobalt than the other vegetables examined, and the group containing mangel beet leaves, beet tops, and turnip greens, averaging 0.40, 0.40, and 0.34 p. p. m., respectively, was appreciably higher in cobalt content than the remaining groups. Lettuce, cabbage, and cowpeas averaged 0.21, 0.19, and 0.16 p. p. m., respectively, while beet roots, sweetpotatoes, and field corn showed the lowest values, averaging 0.07, 0.03, and 0.01 p. p. m., respectively. In general, the data indicated that leafy foods contain the highest amount of cobalt. Some studies also indicated that a deficiency in nitrogen, limiting the growth of the plant, might result in a higher cobalt content in the unfertilized plant, particularly when the supply of cobalt is limited. Averages reported for turnip greens from similar localities (west Gulf Coastal Plain) showed extremes ranging from 0.20 to 1.07 p. p. m., while even greater variation occurred when plants from different regions were compared (minimum 0.03 p. p. m., maximum 1.25 p. p. m.). The authors stress the need of proper and adequate information in order to interpret the data. This should include, if possible, common and scientific names; description of the sample, covering stage of maturity, part of plant used, number of cuttings, condition of plant at harvest, and treatment after harvest; source of sample; description of the soil; and cultural information concerning fertilizer applied, history of plot, rainfall or other climatic data, and the dates of planting and harvesting.

The citrate content of the skeleton as influenced by prolonged feeding of acid-producing and base-producing salt, J. R. LEONARDS and A. H. FREE (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 503-506).—"Three groups of rats were respectively supplemented with sodium citrate, ammonium chloride, and sodium chloride administered by stomach tube. The oral administration of sodium citrate or ammonium chloride in relatively large amounts for 65 days had no influence on the nutritive condition of the animals as evidenced by appearance and growth rate. Blood urea studies did not indicate any impairment in kidney function. The citrate content of the skeleton was not altered by the prolonged feeding of sodium citrate or ammonium chloride."

Dental caries in the cotton rat.—I, Methods of study and preliminary nutritional experiments, J. H. SHAW, B. S. SCHWEIGERT, J. M. MCINTIRE, C. A. ELVEHJEM, and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Jour. Nutr.*, 28 (1944), No. 5, pp. 333-345, *illus.* 1).—In a continuation of the experiments of McIntire et al. (E. S. R., 92, p. 736) on the nutrition of the cotton rat, preliminary observa-

tions have been made on the influence of the diet upon the incidence and extent of dental caries. When a stock diet of crude materials (Steenbock No. 14) was supplemented with greens, the molar teeth of the cotton rat were highly resistant to decay. A synthetic diet, basal ration No. 801 (containing 73 percent sucrose) or No. 802 (containing 67 percent sucrose) produced extensive carious lesions when fed. Practically no signs of tooth decay were apparent in experiments in which dextrin replaced the sucrose in the diet during the 14-week test period. Alteration in particle size of the stock or dextrin diet did not alter the rate of incidence or extent of carious lesions produced. Addition of various liver supplements to the sucrose ration, in order to produce optimal growth, did not succeed in ameliorating the dental damage. Increased amounts of fat soluble vitamin, A, D, E, and K when added to the sucrose did, however, decrease the number and the extent of the carious lesions. Bilateral distribution of the lesions with an appreciable lower rate of incidence in the molars of the upper jaw was noted. From these experiments the authors conclude that the cotton rat is the best experimental animal yet known for the production and study of tooth decay.

Vitamin content of some tropical fruits, their juices and nectars, V. L. QUINONES, N. B. GUERRANT, and R. A. DUTCHER. (Pa. State Col.). (*Food Res.*, 9 (1944), No. 5, pp. 415-417).—The carotene, thiamine, riboflavin, and ascorbic acid contents of papayas, guavas, mangoes, oranges, and commercially prepared pineapple juice were determined by chemical methods. The fruits were obtained from the Florida Subtropical Experiment Station. Papayas (five samples) were found to be a good source of carotene and ascorbic acid, containing from 0.71 to 0.99 mg. of carotene and 29 to 63 mg. of ascorbic acid per 100 gm. of fruit. The amount of carotene present in guavas (four samples) differed widely depending upon the variety studied (from 0.014 to 0.430 mg. percent), while the ascorbic acid content was generally high but decreased somewhat when the fruit was overripe (190 to 296 mg. percent). An appreciable amount of carotene was found in mangoes (three samples) (0.506 to 0.527 mg. percent), while the ascorbic acid content was only fair (15 to 17 mg. percent). Oranges (three samples) showed ascorbic acid values averaging 40, carotene 0.118, and thiamine 0.11 mg. percent. Pineapple juice prepared from cull fruits showed an ascorbic acid content of 21 mg. percent. Various canned nectars and juices were assayed for ascorbic acid. Guava, mango, papaya, and soursop nectars assayed 51, 20, 16, and 11 mg. percent, respectively, while values under 10 mg. percent were found for tamarind (5), banana (3), and quenepa (2) nectars. A footnote reference to ascorbic acid values obtained on other subtropical fruit included the following: Carambola 35.3, carissa 6.48, and loquats 3.96 mg. percent for the fresh fruit.

The effect of spray-drying and the subsequent storage of the dried product on the vitamin A, D, and riboflavin content of eggs, C. A. DENTON, C. A. CABELL, H. BASTRON, and R. DAVIS. (U. S. D. A.). (*Jour. Nutr.*, 28 (1944), No. 6, pp. 421-426, illus. 1).—Samples of fresh liquid eggs and the spray-dried product were obtained from the same batch of material for assay. Vitamin A was measured biologically by rat growth and by the spectrophotometric method, vitamin D by rat assay, and riboflavin by the microbiological method. The results showed that no loss of these vitamins occurred during the spray-drying process. Reported on a dry-weight basis, vitamin A values ranged from 42 to 95 International Units per gram, with relatively good correlation between the biological and physical methods used. Vitamin D ranged from 3.3 to 8.6 I. U. per gram, and riboflavin from 9 to 14 µg. per gram. During storage periods varying from 3 to 6 mo., and at temperatures ranging from 30° to 98° F., vitamin D and riboflavin values were not altered in dried eggs; with increase in temperature and time, loss of vitamin A was marked, falling from 62 to 33 I. U. per gram as measured by the spectrophotometric method.

Far greater loss was observed by the biological assay method. The authors indicate that as the effect of impurities (present or formed in the stored-egg samples) does not present a constant absorption intensity, it would be necessary to establish a conversion factor for each condition of time and temperature of the stored dried product in order to apply the spectrophotometric method with accuracy. Attempts to overcome this difficulty are discussed.

The carotene and vitamin A content of creamery butter produced in Washington, U. S. ASHWORTH, M. MCGREGOR, and H. A. BENDIXEN (*Washington Sta. Bul.* 466 (1945), pp. 8, illus. 1).—In this investigation, conducted from the spring of 1943 through February 1945 as part of a national cooperative project on the vitamin A potency of butter, the methods used for determination of carotene and vitamin A were those developed by the technical committee of the national project. Representative samples of butter were obtained in each of the four seasons from typical creameries in the State, six of these being located in the western part of the State, which is the principal butter producing area, three in the irrigated Yakima Valley, and three in the dry-farming area of the east side of the State. The samples, well wrapped and stored at low temperature for several hours before mailing, were stored upon receipt at the laboratory at 0° F. until analysis could be made. Data were tabulated to show the average carotene and vitamin A content of the butter of each section of the State for each season of the year.

Butter produced in the dry-farming area showed lower vitamin A activity than that produced on the west side for all seasons but the spring of 1943. The greatest differences were found for the summer and fall seasons when the pastures on the coast were better than those on the east side. The average difference between the two areas was 1,400 International Units per pound. Seasonal differences were quite large. The maximum seasonal mean for the State, weighted according to area production, was 22,400 I. U. per pound of butter for the spring of 1943. The minimum value, 11,900 I. U. per pound, was found during the late winter of 1945. The weighted mean for all seasons and all areas was 17,900 I. U., and the range for individual samples fell between the limits of 8,700 and 25,900 I. U. per pound of butter as sold. Storage tests on samples held for a year at 0° and on others held for 6 weeks at 56° showed no significant loss of either carotene or vitamin A during these periods. There was no indication of rancidity development in any of these samples during storage. During the first year, the percentage of vitamin A activity of butter due to carotene was 24 percent in samples from the eastern part of the State and 28.5 percent in samples from the western coastal region. For the second year, the corresponding figures were 27.0 and 34.4 percent. The Yakima Valley samples held an intermediate position each year.

Carotene and chlorophyll content of fresh and processed Swiss chard and beet greens, T. PORTER, M. A. WHARTON, and R. M. BELTZ. (*Mich. Expt. Sta.*). (*Food. Res.*, 9 (1944), No. 6, pp. 434-441).—This paper is the second in a series dealing with the effects of processing on the vitamin content of greens (E. S. R., 92, p. 597). Leaves of the table beet (Detroit Dark Red), the sugar beet (U. S. 200 × 215), and two types of Swiss chard (Fordhook and Rhubarb), experimentally grown and harvested, were analyzed for carotene and chlorophyll by the method of Petering et al. (E. S. R., 83, p. 438), using a Waring Blendor for fine dispersion of the material in absolute alcohol. Readings were compared with standard curves established with carotene that was 90 percent β - and 10 percent α -carotene, and with chlorophyll prepared and purified by C. L. Comar of the Michigan Station. The freshly picked leaves, representing aliquots from the lots of greens picked for processing, were analyzed as blade and midrib, with petiole removed. All varieties contained essentially the same amount of carotene, 5.5 to 6.4 mg. per 100 gm. fresh basis (52 to 62 mg. per 100 gm. dry basis). The chlorophyll ranged

from 135 to 144 mg. per 100 gm. fresh sample (1,171 to 1,448 mg. per 100 gm. dry basis), giving approximately a 24:1 ratio with carotene. There was a correlation between the carotene and chlorophyll contents, significant at the 1-percent level, thus suggesting that carotene content increases with greenness.

Home-cooked greens, whether cooked in a moderate amount of rapidly boiling water or in the minimum of water left clinging to the leaves after the last rinsing, lost little or no carotene; in fact, data calculated to the dry basis indicated apparent gains, particularly in the Rhubarb chard. Institutional cooking (in 8-lb. lots in a steam-jacketed kettle) and holding on the steam table for 10 or 60 min. resulted in higher carotene values than shown by the raw greens when comparison was made on the dry weight basis. These apparent increases were statistically significant only in the case of the Rhubarb chard.

Home drying of the leaves accomplished in a home-made drier used on the gas stove caused an 18 to 30 percent loss of carotene, and storage for 6 to 7 mo. increased this loss to more than 60 percent. Marketing as practiced in the experiment was representative of conditions used in the local market and involved holding the greens in a moist burlap wrapping. After 24 hr. of such storage the leaves were not wilted and there was no significant change in their carotene content.

Carbohydrate metabolism in vitamin B₁ deficiency. A. CHESLER, E. HOM-BURGER, and H. E. HIMWICH (*Jour. Biol. Chem.*, 153 (1944), No. 1, pp. 219-225).—The relationship of the concentrations of blood sugar, lactic acid, and pyruvic acid in normal and thiamine-deficient dogs was determined under two conditions; first, after the injection of glucose, and, second, after the injection of pyruvic acid. In two sets of experiments 16 dogs were used, and their responses on a normal synthetic diet adequately supplemented with vitamins were established as the normal control values. On the thiamine-deficient diet 10 dogs were tested after 3 to 8 weeks (before deficiency symptoms had appeared), and later 7 dogs were tested after they had shown severe acute signs of B₁ deficiency. The postabsorptive value for the lactic acid to pyruvic acid ratio in the normal dog was found to be 7.7, and injection of glucose exerted little influence on this ratio (average 7.4 during the glucose tolerance test). The authors concluded from these experiments that "as a result of vitamin B₁ deficiency in most instances, the postabsorptive level of blood sugar became high and the curve exaggerated. Both lactic acid and pyruvic acid accumulated in the blood of vitamin B₁-deficient animals. In partially deficient animals the average lactic acid to pyruvic acid ratio was lower than in the normal, with postabsorptive values of 5.8 and 6.6; in extremis it was higher than in the control, with a postabsorptive value of 10.7."

Riboflavin content of fresh and processed Swiss chard. T. PORTER and E. KELLY. (*Mich. Expt. Sta.*). (*Food Res.*, 9 (1944), No. 6, pp. 465-470).—This paper, the third in the series (see above), deals with various factors affecting the riboflavin content of Swiss chard. Fordhook and Rhubarb, the two varieties used, contained, respectively, an average of 1.69 and 2.14 µg. riboflavin per gram of fresh leaves. Determinations were made by the microbiological method of Snell and Strong (*E. S. R.*, 82, p. 587).

Separate analyses showed the concentration of riboflavin in the midrib to be about one-sixth of that in the leaf blade. Chard cooked with no water except that clinging to the leaves lost 27 to 36 percent (average 31 percent) of its riboflavin, as compared with the larger losses of 27 to 68 percent (average 54 percent) in lots cooked in a moderate quantity of rapidly boiling water. The larger losses by the latter method are considered as due to the higher initial temperature (that of the boiling water), the alkalinity of the tap water used, and the destructive effect of light, since the cooking vessel was not covered. Different lots of chard cooked by an institutional method and held on a steam table lost approximately from 30 to 65

percent of the riboflavin initially in the cooked chard, whether it was held for 60 min. or for only 10 min. Home-dried chard retained about two-thirds of the riboflavin originally present in the fresh leaves; upon reconstituting and cooking, there was some further loss up to about one-half of that in the fresh leaves. However, the riboflavin content of the dried reconstituted cooked chard compared favorably with that of fresh chard cooked in a moderate quantity of boiling water. The change in riboflavin content of chard held in a moist condition for 24 hr., as for marketing, was variable and not significant.

Photochemical destruction of riboflavin in milk and losses during processing, J. A. ZIEGLER and N. B. KEEVIL (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 605-606).—Assays of riboflavin before and after pasteurization, bottling, or irradiation showed definite loss due to each procedure. Values ranged from 1.97 γ to 2.10 γ per cubic centimeter before pasteurization and 1.75 γ to 1.86 γ per cubic centimeter after, a loss of 9.1 to 16.6 percent. Additional loss during vitamin D enrichment (irradiation) was from 5 to 8 percent, while losses due to bottling and a brief storage period before delivery ranged from 3 to 5 percent.

Riboflavin and thiamin contents of pork loin muscles and their retention during cooking, D. E. BRADY, W. J. PETERSON, and A. O. SHAW. (N. C. Expt. Sta.). (*Food Res.*, 9 (1944), No. 5, pp. 400-405).—The fluorometric method for riboflavin determination and the technics described previously by Peterson et al. (E. S. R., 90, p. 855) were used. Thiamine was also assayed fluorometrically. The longissimus dorsi (I) and psoas major (II) muscles in 10 pork loins and chops were assayed both raw and after roasting or cooking to an internal temperature of 85° C. The results are reported on a "gross" weight basis and on a dry fat-free basis in micrograms per gram of tissue.

Riboflavin values for (I) and (II) were 1.21 and 2.75 $\mu\text{g./gm.}$ on a fresh gross weight basis, with slight increases in riboflavin content noted in the cooked samples. On a dry fat-free basis the riboflavin content of (I) was 5.18 when uncooked and 4.16 when cooked, showing a loss of 19.7 percent. For (II) the values were 12.58 uncooked, 10.24 cooked, and a loss of 18.6 percent. Thiamine values, in $\mu\text{g./gm.}$, for (I) were calculated for both thoracic and lumbar regions. Gross weight values were 13.9 and 15.1, respectively, with no appreciable change in cooking. On the dry fat-free basis, values were 57.8 uncooked, 42.2 cooked, with a 26.6 percent loss in the samples from the thoracic region, and 63.9 uncooked, 51.5 cooked, and 19.4 percent loss in those from the lumbar regions. In (II), the thiamine value on the gross weight basis was 14.8 uncooked, while on the dry fat-free basis it was 61.8; the value for the cooked muscle on the latter basis was 43.2, indicating a cooking loss of 30.1 percent in thiamine. The authors emphasize the need for standardized technics in studying pork products, due to the significant differences in vitamin content in the various muscles and the differences in interpreting results unless calculations are made on a dry fat-free basis.

Riboflavin content of beef, D. E. BRADY, W. J. PETERSON, and A. O. SHAW. (N. C. Expt. Sta.). (*Food Res.*, 9 (1944), No. 5, pp. 406-409).—Continuing their experiments on the riboflavin content of meat (E. S. R., 90, p. 855), the authors have assayed the various muscles of the four main cuts of beef. A total of 20 muscles and 4 organs from 12 carcasses of different grade and feeding history were studied. Significant differences were found in the various muscles within the four cuts. Riboflavin values expressed in micrograms per gram of the fresh lean muscle tissues varied as follows: Prime rib 1.44 to 2.10, chuck 1.45 to 2.02, round 1.20 to 1.82, and short loin 1.30 to 2.28. Mean values, however, for the four cuts ranged from 1.63 to 1.84 and averaged around 1.74 for all cuts for the three grades of beef studied. Riboflavin values for the organs of the 12 cattle were as follows: Tongue 3.07, spleen 3.87, liver 27.21, and heart 10.66 $\mu\text{g. per gram}$ of fresh tissue.

The effect of institutional cooking methods on the vitamin content of foods.—I, **The thiamine content of potatoes**, A. W. WERTZ and C. E. WEIR. (Mass. Expt. Sta.). (*Jour. Nutr.*, 28 (1944), No. 4, pp. 255-261).—A detailed report is given of the thiamine losses occurring during cooking of potatoes. The results have essentially been noted elsewhere (E. S. R., 92, p. 863).

The role of thiamine in the synthesis of fatty acids from carbohydrate precursors, G. E. BOXER and D. STETTEN, JR. (*Jour. Biol. Chem.*, 153 (1944), No. 2, pp. 607-616, illus. 1).—A study of the relationship of dietary thiamine to synthesis of fatty acids in rats on high carbohydrate, fat-free diets was made through the use of D₂O (deuterium oxide). "Three groups of young male rats were kept on a high carbohydrate, fat-free diet, with the following provisions: Group A, complete diet, offered ad libitum; group B, diet lacking in thiamine, offered ad libitum; group C, complete diet, restricted in quantity to the amount consumed by group B. After 16 days, the body fluids of all the animals were enriched with D₂O and kept at constant isotope level for 5 days. In groups B and C, the quantity of newly synthesized fatty acid deposited, calculated from the isotope values, was much less than in group A. The findings indicate that the decrease in fat content in rats on thiamine-deficient diets results from failure of synthesis and deposition of fatty acids, and that this failure is attributable chiefly to the diminished food intake rather than to any specific action of thiamine. The saturated fatty acids were found to be consistently richer in deuterium than the singly unsaturated fatty acids. This fact was taken to support the belief that the saturated acids are the primary products of fatty acid synthesis in rats, and that oleic and palmitoleic acids are formed from these by secondary dehydrogenation. The distribution of deuterium along the fatty acid chain was found to be approximately uniform in the fat from both groups A and B."

État actuel du problème de la structure de la Vitamine P et de son rôle fonctionnel (The present state of the problem of the structure of vitamin P and its functional role), J. LAVOLLAY (*Paris: Hermann & Co.*, 1943, pp. 127-138).—This paper presents a discussion and a review of the historical background leading to our present knowledge of the problem. Recent French experiments (1941, 1942) with various concentrates and chemical substances are noted. The author emphasizes as the criteria which should determine vitamin P activity an increase in capillary resistance and a prolongation of the pharmacodynamic action of adrenalin. Catechin, a derivation of chroman, possesses these properties to a marked degree.

Vegetables to supply needs of vitamin C, C. L. MCWHIRTER (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 7, p. 8).—Analyses of canned turnip greens, spinach, peas, and snap beans, carried out as part of a study of the nutritive value of foods cooked in large quantities, showed that these vegetables as taken from the can were low in ascorbic acid. Drained of their liquor and heated with added water (except for canned peas which were heated in their own liquor), there were still further losses of ascorbic acid, so that these four vegetables as finally served furnished, respectively, only 6.7, 6.0, 2.8, and 0.6 mg. of the vitamin per serving. It is pointed out that canned vegetables make other contributions to the diet than that of ascorbic acid and that their lack in this vitamin may be made up by including some good sources of ascorbic acid in the daily menu.

Vitamin C content of potatoes and the effect of cooking in [quantity], O. SHEETS (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 6, pp. 1, 2, 7).—Results of work conducted as part of a cooperative study on cooking losses at Army and Navy training camps, are presented briefly to show that in steaming the pared potatoes lost from 9.4 to as much as 53.5 percent of their ascorbic acid content. The larger loss was associated with a longer steaming period. Other findings about the nutritive value of potatoes and sweetpotatoes, as observed by other workers, are discussed briefly.

Effect of snow-ice on the retention of vitamin C in green vegetables displayed in a retail market, L. GORDON, R. M. GRISWOLD, and T. PORTER (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 322-327, illus. 3).—Leaf lettuce, green beans, and spinach supplied to a local retail grocery by Michigan wholesale dealers were sampled in triplicate as the produce was brought to the store in the early morning. One sample was taken immediately to the laboratory where its ascorbic acid content was determined, while the other two were analyzed approximately 8 hr. later after being held for the day in the grocer's display cases, one of which was a non-refrigerated iron rack and the other one a display unit which permitted the vegetables to be held on snow-ice. The results of such investigations at 12 different times showed that ascorbic acid was lost rapidly from all these vegetables when they were displayed without ice at room temperature (70°-86° F.), and that ascorbic acid retention as well as quality and appearance were much improved by displaying the vegetables on snow-ice. The data, calculated to the dry weight basis, showed leaf lettuce to lose 21.7 percent of its ascorbic acid when held without refrigeration on the sheet-iron rack for 8 hr. but to suffer no loss (an apparent 15 percent gain) of this vitamin when displayed on snow ice. Green beans during these two types of display lost, respectively, 11.0 and 2.6 percent of ascorbic acid originally present; and spinach, 44.8 and 3.5 percent, respectively.

Vitamin C economy in the human subject, M. PIJOAN and E. L. LOZNER (*Bul. Johns Hopkins Hosp.*, 75 (1944), No. 5, pp. 303-314, illus. 4).—Reiterating the statement made in an earlier review article (E. S. R., 92, p. 599) that "the only known anatomic lesion of vitamin C deficiency is the scorbutic process" and that the evaluation of ascorbic acid deficiency in any given individual from an assay of his diet is untrustworthy, the authors present data from two separate studies leading to the following conclusions: "It would appear that an adequate intake of vitamin C should be between the protective minimum (18-25 mg. daily) and the amount required to maintain saturation as represented by excretion in the urine (80-100 mg. daily). The precise intake between the minimal protective dose and the saturation dose is, in the absence of clinical evidence, largely a matter of conjecture."

A note on the minimum requirements of man for vitamin C and certain other vitamins, V. A. NAJJAR, L. E. HOLT, JR., and H. M. ROYSTON (*Bul. Johns Hopkins Hosp.*, 75 (1944), No. 5, pp. 315-318).—Seven young adults were given for 18 mo. an experimental diet designed primarily to evaluate the thiamine requirement. The water-soluble vitamins, provided in carefully measured quantities, were given in constant daily amounts except for thiamine, which was gradually reduced until deficiency symptoms appeared. No symptoms of any deficiency other than that of thiamine were observed, with the daily intakes of the other water-soluble vitamins as follows: Ascorbic acid, 25 mg.; nicotinamide, 25 mg.; riboflavin, pyridoxine, calcium pantothenate, inositol, and *p*-aminobenzoic acid, each 1 mg.; and choline chloride, 5 mg. These experiments established the upper limits for minimal requirements, although they did not indicate the actual minimal requirement except for thiamine, which is discussed by Holt, Jr., in another paper (E. S. R., 93, p. 370). "Of particular interest are the observations on ascorbic acid, which confirm those of Pijoan and Lozner [above] that scurvy does not develop on a daily intake of 18-25 mg. ascorbic acid."

The metabolism in vitro of tyrosine by liver and kidney tissues of normal and vitamin C-deficient guinea pigs, T. H. LAN and R. R. SEALOCK (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 483-492, illus. 1).—The in vitro respiration of tissue slices was determined, using a modified Warburg technic. The QO_2 value of the scorbutic liver slices was 28.2 percent higher than that of normal liver slices. No statistically significant differences in O_2 and CO_2 production were noted with the kidney slices. Addition of *l*-tyrosine to the substrate in flasks containing normal

liver tissue produced a marked increase in O_2 uptake, while the scorbutic liver tissue showed practically no change: In normal liver 1 atom of extra O_2 is consumed for each mole of tyrosine, while in the scorbutic liver the ratio of atoms of O_2 to moles of tyrosine is less than 0.2. Administration of ascorbic acid to deficient guinea pigs (20 mg. for 6 days) produced results similar to that obtained in normal animals. CO_2 production in liver tissues from both normal and deficient animals was considerably smaller but showed the same trend as the O_2 production. Kidney tissues exhibited a much lower O_2 production but maintained the same relationships as the liver tissues in the presence of tyrosine, while the CO_2 production was insignificant. The oxidation of tyrosine by normal tissues and the lack of oxidation by scorbutic tissues in vitro is discussed and correlated with previously reported work in vivo.

The biological potency of the natural tocopherols and certain derivatives, M. JOFFE and P. L. HARRIS (*Jour. Amer. Chem. Soc.*, 65 (1943), No. 5, pp. 925–927).—The authors have employed a rat bioassay procedure based upon that of Mason (*E. S. R.*, 88, p. 564), with the exception that vitamin E supplements were fed on the fourth, fifth, and sixth days after conception instead of daily for the first 10 days. The median fertility dose required to produce a litter efficiency of 50 percent determined the potency of the tocopherol tested. The results in order of decreasing potency—and expressed in amounts needed to give an equivalent median fertility dose—were as follows: Natural α -tocopherol and its succinic acid ester 0.75 mg., pure natural β -tocopherol 1.9 mg., azobenzene-4-carboxylate ester of β -tocopherol 4.0 mg., natural γ -tocopherol both as the free alcohol and the palmitate 9.0 mg., and synthetic *dl*- α -tocopherol 1.0. The authors concluded that natural β -tocopherol was only four-tenths as potent as the α form and γ -tocopherol was only one-twelfth as potent as natural α -tocopherol.

Biological activity of natural and synthetic tocopherols, P. L. HARRIS, J. L. JENSEN, M. JOFFE, and K. E. MASON (*Jour. Biol. Chem.*, 156 (1944), No. 2, pp. 491–498).—Two different laboratories employing the method of Mason (*E. S. R.*, 88, p. 564) or of Joffe and Harris (noted above) collaborated in this study to determine the relative biological activity of synthetic and natural tocopherols. Although certain discrepancies in the results between laboratories were noted in relation to the synthetic *dl*- γ -tocopherol, the findings were in agreement in indicating that natural α -tocopherol was approximately 50 percent more potent than synthetic *dl*- α -tocopherol. Natural β -tocopherol showed about 100 percent more activity than the synthetic *dl*- β -tocopherol. The activity relationships of natural γ -tocopherol and synthetic γ -tocopherol were difficult to establish. In one laboratory synthetic γ -tocopherol was found to be one-half as potent as the natural form, whereas in the other cooperating laboratory it was less than one-tenth as active as the natural γ -tocopherol and 100-mg. doses consistently gave negative responses.

The defect in utilization of tocopherol in progressive muscular dystrophy, A. T. MILHORAT and W. E. BARTELS. (Cornell Univ.). (*Science*, 101 (1945), No. 2613, pp. 93–94).—Due to the formation of a highly active compound when the tocopherol was subjected to certain chemical treatments, its action on muscular dystrophy and creatinuria was enhanced. The biologically active substance produced was considered to be a condensation product of ethylene glycol and tocopherol in ether linkage. A substance, thought to be the monoether of inositol and tocopherol, was prepared and considered to be 40,000 times as effective as wheat germ itself. Administration of inositol and tocopherol together in equimolecular amounts produced an effect on creatinuria about one-eighth to one-thirtieth as great as the condensation product.

TEXTILES AND CLOTHING

Fellmongering investigations, Papers I-XII (*Austral. Council Sci. and Indus. Res. Bul.* 184 (1945), pp. 232, illus. 41).—The papers on removal of wool from sheepskins in this series, each with bibliographies of pertinent literature, comprise: I, A Review of the Fellmongering Industry in Australia (includes appendixes on structure and chemical composition of sheepskin and glossary of fellmongering terms) (pp. 9-44), II, A Physical Method of Following the Loosening of Wool on Sheepskins (pp. 45-55), both by F. G. Lennox; III, The Bacterial Flora of Sheepskins (pp. 57-87), IV, Bacteria Responsible for Loosening of Wool on Sheepskins (appendix on unsuccessful attempts to sterilize sheepskin) (pp. 89-116), both by M. E. Maxwell; V, The Removal of Dissolved Oxygen From Soak Water by Sheepskins, by W. J. Ellis (pp. 117-123); VI, Studies of the Soaking Operation, by F. G. Lennox, W. J. Ellis, and M. E. Maxwell (pp. 125-141); VII, The Effect of Temperature on the Rate of Sweating, by F. G. Lennox and M. E. Maxwell (pp. 143-153); VIII, Ammonia in Relation to the Sweating of Sheepskins, by F. G. Lennox, M. E. Maxwell, and W. J. Ellis (pp. 155-165); IX, the Wool-Loosening Activity of Ammonia and Some Related Compounds (pp. 167-193), X, Treatments Which Tighten the Wool on Sheepskins (pp. 195-206), XI, The Recovery of Wool From Skin Pieces by Digestion With Mould Protease or Papain (pp. 207-226), all by F. G. Lennox; and XII, Histological Studies on the Wool Root, by W. J. Ellis (pp. 227-232).

Cotton farmers' stake in higher family incomes, D. DICKINS (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 8, pp. 1, 8).—A brief summary from the results of a clothing survey by the station home economics department is presented to show the relative expenditure of poorer and better-off Mississippi families for cotton clothing. It was noted that the number of cotton garments increased with increased income. "Low-income families spend increased incomes on consumers' goods, including cotton clothing and household goods. Therefore, it behooves cotton farmers to participate actively in plans for full employment after the war; to cooperate with planning commissions and chambers of commerce in locating industries whereby white and Negro wage earners can secure employment."

HOME MANAGEMENT AND EQUIPMENT

Management in Michigan homes, I. H. GROSS and E. A. ZWEMER (*Michigan Sta. Quart. Bul.*, 27 (1945), No. 3, pp. 273-281, illus. 1).—This article discusses findings on family planning and the management of money, time, and energy, and the less material side of family living. A more detailed account has been noted (*E. S. R.*, 92, p. 748).

A study of radiant baseboard heating in the I=B=R research home, A. P. KRATZ and W. S. HARRIS (*Ill. Engin. Expt. Sta. Bul.* 358 (1945), pp. 32, illus. 14).—In cooperation with the Institute of Boiler and Radiator Manufacturers, a discussion is given of the results of tests made during the heating seasons of 1943-44 and 1944-45 on a hot-water heating system in which an unusual design of radiation was employed. In these tests both a one-pipe, forced-circulation, hot-water system and a two-pipe, gravity, reversed-return, hot-water system were used. The objects of the investigation were to determine the effect of introducing heat into rooms by means of long, low panels, heated by means of hot water. These panels were placed near the floor and extended along the exposed walls of the rooms. A second object was to compare the operating characteristics of the panels with those of conventional, small-tube radiators.

REPORTS AND PROCEEDINGS

Research in Agriculture: Annual Report [of the Louisiana Station, 1944], W. G. TAGGART ET AL. (Partly coop. U. S. D. A.). (*Louisiana Sta. Rpt. 1944*, pp. 179, illus. 35).—In addition to sociological studies noted on page 125, this report presents data on nutrition research, including the vitamin A content of milk and butter, the ascorbic acid value of home-canned tomatoes and raw and cooked collards, the ascorbic acid and carotene contents of dehydrated sweetpotatoes, the detoxication of tung meal, the toxic principles of the tung nut, and growth stimulants for the microbiological biotin assay; agricultural economics, including a survey of farmers' cooperative business associations, cotton and milk marketing, the poultry and egg market at New Orleans, costs and returns from sugarcane farms and mills, prices for farm crops and livestock, milk, and farm wages, farm ownership under the program of the Farm Security Administration, and wartime costs of production of milk, rice, and potatoes; agricultural engineering, including sugarcane weed control and drainage machinery, sweetpotato machinery and dehydration, alligatorweed control, rice harvesting and storage, and erosion studies on the lower Mississippi loessial soils; animal industry, including swine breeding, pasture improvement and winter grazing, supplements for fattening pigs, and raising and marketing calves and yearlings; crops and soils, including fertilizers and lime for field crops and pastures, loss of nitrogen from flooded soil, tolerance of rice to salt water, cotton, soybean, and oats varieties and fertilizers, corn culture, effect of hormones on field crops, retention of phosphates by soils, Dallis grass improvement, and fertilizers and rotations for rice; dairy research, including iodinated casein for dairy cows, heat tolerance and blood constituents of Jerseys and Holsteins, mineral deficiencies of Louisiana feeds, artificial insemination, extension of grazing period, forage production of clovers, Dallis, lespedeza, and other crops, and dehydrated sweetpotato flour in ice cream; entomology, including tests with DDT, use of nicotine with calcium arsenate to check the cotton aphid, and control of sugarcane borer, tomato fruit worm, melon aphid and pickleworm, sand wireworms, and velvetbean caterpillar on soybeans and peanuts; food preservation, including freezing of sweetpotatoes, okra, and potatoes, sugars and sirups for frozen fruits, effect of salt on frozen vegetables, ascorbic acid as a preventive of discoloration, and shrimp spoilage; forestry on various land types; horticulture, including fertilizers for oranges, and breeding of sweetpotatoes, pumpkins, and cabbage; plant pathology, including diseases of sugarcane and rice, bordeaux mixture for stalk rot of onions, control of arborvitae blight by spraying, DD for control of nematodes and weeds, seed treatment of rice, oats, corn, and peanuts, black rot and soil rot of sweetpotatoes, black scale of Easter lily, downy mildew of cucumbers, strawberry leaf blight, fertilizers and root rot of rice, late blight of potatoes, and pink root infection in shallots; poultry research, including egg coolers for the farm, dried muskrat meal in chick rations, use of sulfur for poultry, need of green feed, and poultry breeding; sugarcane varieties; veterinary science, including use of phenothiazine for horses and mules, anaplasmosis in cattle, parasites of poultry and cattle, *Crotalaria spectabilis* poisoning of livestock, and brucellosis in swine and cattle; and at the substations, including at Hammond breeding and variety tests with okra, peppers, cucumbers, and pecans, and fertilizers and lime for strawberries; at Calhoun variety tests with cotton, corn, and sweetpotatoes, fertilizers for corn, oats, sweetpotatoes, peaches, and in rotations, green feed for poultry, poultry houses for north Louisiana, and hogging off corn and sweetpotatoes; at St. Joseph, cotton and corn production, and control of boll weevil and cotton aphid; at Crowley, rice culture (fertilizers, rotations, residual effect of calcium arsenate, and breeding), and oat varieties and fertilizers; and in cooperation with the U. S. Department of Agriculture, tests with DDT, nicotine

as a substitute for rotenone, sweetpotato weevil studies, bee culture (pollen-trap records and pollination, scale colonies and honey production, and controlled mating), potato breeding, corn hybrids, cotton culture and diseases, and sweetpotato diseases.

Nebraska agriculture, 1944: Fifty-eighth Annual Report of [Nebraska Station, 1944], W. W. BURR. (Partly coop. U. S. D. A.). (*Nebraska Sta. Rpt. [1944], pp. 124+, illus. about 20*).—This report presents research findings in soils, including erosion control and moisture conservation, crop residue management, fertilizers for corn, sugar beets, and oats, and the nature and properties of soil clays and soil phosphorus; field crops, including improvement of wheat, barley, oats, sorghum, Sudan grass, soybeans, corn, popcorn, safflower, potatoes, alfalfa, sweet-clover, and castor-beans, time of planting oats, wheat (including vernalization tests), and potatoes, effect of simulated hail on corn yields, harvesting sweetclover, alfalfa, and brome-grass seed, and eradication of bindweed, hoary cress, leafy spurge, Russian knapweed, and dogbane; horticultural crops, including storage of seed potatoes, potato culture on dry land, crop rotations, vitamin content of potatoes and tomatoes, tomato breeding, sweetpotato culture, orchard irrigation, culture, spraying, and pruning, raspberry breeding, and fruit stocks; plant diseases, including diseases of beans, charcoal rot of corn and sorghum, seed treatment of sorghum and soybeans, and diseases of potatoes and tomatoes; chemical studies with plant materials, including effect of leafhopper damage on the carotene content of alfalfa, a protein-digestion inhibiting substance in raw soybeans, microbial amylases, baking properties of flour, and yield of nutrients from cereal hays; insects and rodents, including potato flea beetles, psyllids, leafhoppers, aphids, and tests with DDT, grasshoppers, chinch bugs, hessian fly, corn rootworms, use of DDT on vine crops, eggplant, and beans, sabadilla for chinch bugs and squash bugs, bean insect control, wild alfalfa pollinators, cattle grubs, and cockroach control; feeding cattle and hogs, including comparisons of feeds and pasture studies; dairy production and manufacture, including growth relationships, reproduction, artificial insemination, milk substitutes for growing calves, wartime problems in ice cream making, vitamins in cheese and butter, pasteurization of cream, and cheese production; poultry nutrition and management, including safflower seed for chicks, low-cost rations, vitamin B complex requirements for growing poult, battery v. floor brooding for chicks, moldy corn for chicks, wheat fermentation byproducts for laying hens, and riboflavin distribution in feedstuffs; swine erysipelas; agricultural engineering, including weed control, home dehydration of food, cooling milk and cream, and machinery requirements for corn production; rural economics, including cost of corn production, farm costs, land use planning, land tenure, and farm credit; home economics, including blood regeneration in blood donors, family relationships, tests of small food mixers, and methods of jar closure in canning; and results at the substations with rotations, variety tests of wheat, oats, barley, corn (including hybrids), sorghums, pinto beans, and cherries, pump irrigation, winter feeding of range cattle, delayed feeding of yearling heifers, and lamb feeding tests.

Progress report of the Inter-American Institute of Agricultural Sciences, May 1, 1945 ([Washington, D. C.]: Inter-Amer. Inst. Agr. Sci., 1945, pp. 40+, illus. 24).—This report includes, among other data, notes on a new hybrid tomato for the Tropics; coffee pulp silage as a cattle feed; teak, rubber, and *Cinchona* production; breeding corn, tomatoes, grapes, blackberries, and guava; control of the nodule fly or "tórso" (*Dermatobia nominis*) and the cattle tick; culture of legumes, grasses, and adlay; sweetpotato utilization for stock feed; acclimatization of cattle; and the supplementation of pastures.

Brief history and progress report of the Inter-American Institute of Agricultural Sciences, April 1945 ([Washington, D. C.]: Inter-Amer. Inst. Agr. Sci., 1945, pp. 40+).—This report deals mainly with administrative phases, including methods of handling projects and a summary of monthly activities. Data on the growth of top-budded rubber trees are also included.

MISCELLANEOUS

USDA, manager of American Agriculture, F. DEERING (*Norman: Univ. Okla. Press, 1945, pp. 213+*, illus. 20).—"This book is an appeal for revaluation of our approach to the farm problems so that solutions may be found and for organization of [the U. S. Department of Agriculture] on that basis." The existing organization is analyzed, and the various activities are discussed with special reference to their contacts and relationships with each other and with individual farmers.

With reference to research, it is stated that "the USDA has tackled the business of research by spreading it out through all departments. Some have relatively large sums to carry on minor problems, while others have scanty funds to tackle huge problems. In too many instances, research is a side line that is submerged and confused with various other activities of the agency trying to carry it on. There should be a single research division of the USDA, with all problems of agricultural research assigned to specialists and subdivisions working under that division on a unified, thoroughly co-ordinated basis."

The International Confederation of Agriculture and the renewal of international collaboration in the field of agriculture, E. LAUR (*Brugg. Switz.: Effingerhof Ltd., 1945, pp. 36*).—In this pamphlet the interim president of the confederation advocates its partial reorganization and resumption of activity. The status of other world organizations of agricultural interest is also discussed.

Our agricultural debt to Asia, W. T. SWINGLE (*In The Asian Legacy and American Life*, edited by A. E. CHRISTY. *New York: John Day Co., 1945, pp. 84-114, illus. 11*).

Mississippi Farm Research [June-August 1945] (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), Nos. 6, pp. 8, illus. 4; 7, pp. 8, illus. 1; 8, pp. 8, illus. 2).—In addition to articles noted elsewhere in this issue and weather notes, No. 6 contains *Mechanization of the Cotton Harvest*, by F. J. Welch and D. G. Miley (pp. 3-6), also to be published as a station bulletin. No. 7 contains *Prevention of [Plant] Disease the Cheapest Control Method*, by J. J. Presley (pp. 1, 7-8); *Calcium Silicate Slag as a Source of Agricultural Lime*, by J. L. Anthony (pp. 1, 2); *A Year of Research in Mississippi Farm Problems*, by C. Dorman (pp. 3-6), also to be published in bulletin form as a part of the director's report; *Differentials in Productivity and Income of Tenure Groups*, by H. P. Todd (pp. 1, 7); *Mississippi Farm Income Increased During War Years*, by D. W. Parvin (p. 7); and *Grasses and Legumes for Growing Pullets and Hens*, by H. D. Polk (pp. 1, 8). No. 8 contains *Mid-Year Farm Outlook Situation for Mississippi*, by C. Ellis (pp. 1, 8); *Watch Soybeans for [Velvetbean] Caterpillar*, by C. Lyle (p. 1); *Large Modern Gins More Profitable and More Efficient*, by D. G. Miley (pp. 1, 2); and *A Year of Research in Mississippi Farm Problems*, by C. Dorman (pp. 3-6), also to be published in bulletin form as part 2 of the director's report.

NOTES

California University and Station.—Dr. Ralph H. Smith, professor of entomology and entomologist at Los Angeles, died September 22, 1945, aged 57 years. Receiving the Ph. D. degree from the university in 1925, he had subsequently been continuously associated with its instruction and research, studying especially insects affecting ornamental trees and shrubs, oil sprays, and insect ecology. He had also served as associate entomologist in the Idaho Station from 1918 to 1922.

Colorado College and Station.—Dr. R. W. Roskelley, associate rural sociologist, has accepted a corresponding position in the Washington College and Station. Dr. Howard C. Dickey, associate professor of animal husbandry and associate animal husbandman, has been appointed associate professor in animal and dairy husbandry in the University of Vermont.

Connecticut [New Haven] Station.—Dr. Vincent W. Cochrane has been appointed assistant plant pathologist vice Dr. George A. Gries, resigned to accept a position as associate plant pathologist in the Indiana Station. Dr. Cochrane is expected to work on root rot diseases of plants, with special attention to ornamentals such as roses, gladiolus, delphiniums, and Canterbury bells.

Idaho University and Station.—Dean and Director E. J. Iddings, associated with the institution since 1910, has been granted a year's sabbatical leave effective November 1, 1945, on which date he retired from active administrative duties as dean of the College of Agriculture and director of the station and the extension division. C. W. Hickman, head of the department of animal husbandry, has been designated acting dean of the college and director of the station and extension work.

Massachusetts College and Station.—According to *Hatchery Tribune*, funds were provided by the last legislature for a new laying and brooder house for experimental work and new laying and turkey houses for the college farm.

Dr. Walter H. Hodge, instructor in botany, has accepted a one-year visiting professorship at the University of Medellin in Colombia.

Michigan College and Station.—Plans are being worked out for financing a group of self-liquidating buildings to cost about \$6,000,000. Among these is a food research building to cost \$250,000. A new poultry building is also planned for the near future.

Gifts totaling \$10,170, mainly for research projects, have recently been accepted.

Dr. Robert L. Carolus, physiologist in the Virginia Truck Station, has been appointed professor and research professor of horticulture vice K. C. Barrons, who resigned several months ago to go into commercial work. Dr. Fred T. Mitchell, counselor for men and the director of the Service Men's Institute, has been appointed president of the Mississippi College, effective October 1, 1945.

The death is noted on August 4, 1945, of T. Glenn Phillips, landscape architect of the college since his graduation therefrom in 1902; on July 21 of Robert J. Patrick, instructor in horticulture; and on September 6, of Winifred S. Gettemy, associated with the home economics work from 1918 to 1942.

Cornell University and Station.—Dr. Kenneth L. Turk, professor of animal husbandry, has been appointed head of the department vice F. B. Morrison, who will devote full time to research.

Dr. Harold H. Smith, assistant geneticist in the tobacco investigations of the U. S. D. A. Bureau of Agricultural Economics, has been appointed associate professor of plant breeding.

New York State Station.—Dr. Roger W. Bledsoe, associate agronomist in the Florida Station, has been appointed assistant professor of pomology, effective November 16, 1945.

North Carolina College and Station.—Dr. L. D. Bayer, associate dean, has been appointed dean of agriculture, but will continue as director of the station. Former Dean I. O. Schaub is to devote full time as director of extension. Other appointments include Dr. C. N. Clayton, associate plant pathologist at the South Carolina Truck Station, as research associate professor of plant pathology; Dr. H. A. Stewart, assistant professor and assistant animal husbandman in the Minnesota University and Station, as research associate professor of animal husbandry; Thomas N. Blumer, as assistant professor of animal husbandry; Dr. Martin A. Abrahamsen, associate professor and associate agricultural economist in the West Virginia University and Station, as professor of agricultural economics; and Ellis G. Diseker, as research associate professor of agricultural engineering.

Ohio State University and Station.—Dr. Alfred Van Wagener, associate professor and poultry specialist in the university and associate in poultry investigations in the station, has resigned to become marketing specialist for the Northeastern Poultry Producers Council at Trenton, N. J. Dr. Barbara Shalucha of the university department of horticulture has been appointed assistant curator of elementary instruction in the Brooklyn Botanic Garden.

Vermont University.—Preliminary plans have been drawn for a college poultry plant of 1,000 hens' capacity, for which the last legislature appropriated \$30,000.

Virginia Polytechnic Institute and Station.—Effective January 1, 1946, Dr. A. W. Drinkard, Jr., director of the station since 1916, has resigned to become assistant director, and H. L. Price has retired as dean of the School of Agriculture. Drs. Harold N. Young and Thomas B. Hutcheson, heads of the departments of agricultural economics and agronomy, have also been appointed, respectively, director of the station and dean of the School of Agriculture.

John J. Vernon, since 1922 pioneer agricultural economist of the station, died October 6, 1945. He had previously served as assistant in horticulture in the Iowa College and Station from 1898 to 1900, head of the college and station work in agriculture in the New Mexico College and Station from 1900 to 1908, and the Florida University from 1908 to 1915 (dean 1910-15), and was an agricultural economist in the U. S. D. A. Bureau of Agricultural Economics from 1921 to 1923.

Leave of absence for one year has been granted to Drs. F. L. Underwood, agricultural economist, and L. B. Tate, associate rural sociologist. The resignations are noted of Dr. M. C. Wilson, Jr., as assistant agronomist, and Mattie Lou Sholes as assistant home economist. Dr. W. L. Ingalls has been appointed associate animal pathologist, Dr. T. J. Smith of the Arizona University and Station, associate agronomist (plant breeding); T. M. Bush, Jr., economic land classifier, and Q. B. Zielinski, assistant horticulturist. Col. W. R. Perkins, Capt. A. M. Baisden, and Lt. (j. g.) M. L. Bobb have resumed their respective duties as superintendents of the Washington and Caroline County Substations and assistant entomologist.

Wisconsin University and Station.—E. J. Delwiche, professor of agronomy and director of the northern branch stations, has been appointed professor emeritus. Other appointments include Dr. Henry Lardy as assistant professor of biochemistry; Edwin M. Foster as assistant professor of bacteriology; George L. Wright as assistant professor of branch stations and assistant superintendent of county agents; Dr. Nathaniel M. Allen as associate professor of dairy husbandry; Alvin T. Carew as assistant professor of agricultural economics; and Dr. Margaret Cooper as associate professor of textiles and clothing.

U. S. Department of Agriculture.—The retirement on September 30 is noted of Dr. C. W. Warburton, bringing to a close a career in the Department of more than 40 years. Beginning in the Office of Farm Management in 1902 as assistant agriculturist, he was given charge of the Department's investigations with oats in 1907. From 1911 to 1912 he was engaged in editorial work for a private publishing company but returned in the latter year to the Office of Cereal Investigations. On several occasions he was detailed to administer Federal seed-grain loans in various States and to farmers in drought-stricken areas. In 1920 he took charge of cereal agronomy investigations, and in 1923 became director of the Extension Service. Since 1940 he had served as Deputy Governor of the Farm Credit Administration.

The retirement is also noted of Dr. Philip L. Gile, associated with the soil chemistry investigations since 1921. He had previously been assistant chemist in the Missouri Experiment Station in 1907 and assistant chemist and chemist in the Puerto Rico Federal Station from 1907 to 1918.

D. F. J. Lynch, director of the Southern Regional Research Laboratory in New Orleans since its establishment in 1938, died in that city on October 15, 1945. He had been associated with the Bureau of Agricultural and Industrial Chemistry since 1919 and had headed the Department's agricultural byproducts laboratory at Ames, Iowa, for several years.

The death on November 20 in Washington, D. C., is noted of Dr. Elmer O. Wootton, an early station botanist and Department economist, at the age of 80 years. Appointed professor of botany and botanist in the New Mexico College and Station in 1890, he served there until 1896 and again from 1898 until 1911, when he was appointed assistant agriculturist in the Office of Farm Management of the Department. In 1920 he was transferred to the Bureau of Agricultural Economics and served there as an economics analyst until his retirement in 1935. He was a specialist in the flora of New Mexico and the utilization of arid grazing lands and semiarid croplands.

Charles L. Chambers, a principal agriculturist in the Extension Service, died November 24, 1945, in his sixty-second year, terminating a service for the Department of 29 years, mainly as director of field agents in the Southern States. He was a native of Alabama and graduated in 1908 from Alabama Polytechnic Institute, by which he was employed as livestock extension specialist in 1916-17.

Anna C. Justin has been appointed a home economist in the Office of Experiment Stations.

Inter-American Institute of Agricultural Sciences.—According to a recent report (see p. 141), there are now 30 structures virtually completed and 2 others are under construction. In addition, 18 laborers' cottages are being remodeled and improved. Experimental plantings are well under way with strategic and food and forage crops, and there are active projects on their utilization and the control of animal parasites and other cattle problems.

Agricultural experimentation in South America.—A 5-year development plan has been approved by the Colombian Congress which more than doubles the appropriations. Among the provisions is an expansion of the work of the agricultural experiment stations from their present complement of 60 to at least 250 technicians. Additional stations will be provided, including one to cooperate with the United States Department of Agriculture. Among the goals is agricultural self-sufficiency as regards food, fiber, and oil crops.

The Third Bolivian National Conference on Agriculture, held on August 14, 1945, recommended the establishment as soon as possible of three central experiment stations, also the establishment of stations dealing with the scientific breeding, care, and domestication of animals.

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RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Physical methods of organic chemistry, I, edited by A. WEISSBERGER (*New York 3: Interscience Pubs., 1945, vol. 1, pp. 736+*, illus. 273).—The first of two projected volumes is here noted. Under the general editorship of the author, methods for the measurement and interpretation of numerous physical properties and constituents of organic compounds are dealt with by collaborating authors, as follows: Melting and freezing temperatures, by E. L. Skau and H. Wakeham (pp. 1-46) (U. S. D. A.); boiling and condensation temperatures by W. Swietoslawski (pp. 47-67); density, by N. Bauer (pp. 69-106) (Univ. N. H.); solubility, by R. D. and M. J. Vold (pp. 107-133); viscosity, by H. Mark (pp. 135-147); surface and interfacial tension, by W. D. Harkins (including a section entitled Parachor, by G. W. Thomson) (pp. 149-209); properties of monolayers and duplex films, by W. D. Harkins (pp. 211-252); osmotic pressure, by R. H. Wagner (pp. 253-276); diffusivity, by A. L. Geddes (pp. 277-310); Calorimetry, by J. M. Sturtevant (pp. 311-434); Microscopy, by E. E. Jelley (pp. 435-530); Determination of Crystal Form, by M. A. Peacock (pp. 531-559); Crystallochemical Analysis, by J. D. H. Donnay (pp. 561-583); X-Ray Diffraction, by I. Fankuchen (pp. 585-620); Electron Diffraction, by L. O. Brockway (pp. 621-652) (Univ. Mich.); and Refractometry, by N. Bauer and K. Fajans (pp. 653-736) (Univ. N. H. and Univ. Mich.).

Refractive indices of dextrose and invert sugar solutions, F. W. ZERBAN and J. MARTIN (*Jour. Assoc. Off. Agr. Chem., 27 (1944), No. 2, pp. 295-302*).—The refractive indices of dextrose and invert sugar solutions for sodium light at 20° [C.] were measured with a precision refractometer, and equations for the relation between the refractive index and the percentage of sugar by weight in air were computed. Tables of the experimental and computed values, to the fifth decimal place of n are compared with previous data. It was found that the Vosburgh-Browne rule concerning the physical properties of mixed sugar solutions applies closely to the refractive indices of equimolecular mixtures of dextrose and levulose.

Lactic acid in dairy products.—III, The effect of heat on total acid and lactic acid production and on lactose destruction, I. A. GOULD. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 28 (1945), No. 5, pp. 367-377, illus. 5*).—Whole milk and

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied on request.

skim milk, heated in sealed cans at 100° C. for periods up to 8 hr., and at 116° for periods up to 2.5 hr., were examined for increases in titrable acidity by electro-metric titration, lactic acid by a procedure essentially that of Hillig, and lactose by the polarimetric procedure. In certain trials, 0.3 percent sodium citrate or disodium phosphate was added to the skim milk prior to heating.

The lactic acid produced by these treatments was within the ranges of 3 to 7 mg. per 100 gm. of milk and constituted only 5 percent or less of the total acid produced as determined by titration. The presence of the stabilizing salts during heating appreciably increased the titrable acidity, but increased the lactic acid by not more than 2 to 3 mg. per 100 gm. Lactose destruction resulting from these heat treatments amounted to about 25 to 30 percent of the total lactose in the normal samples. Greater destruction occurred when the citrate or phosphate was present. The slight increase in lactic acid resulting from heat treatment is held to indicate that the use of proper lactic acid measurements on fresh concentrated milk products may be relied upon to reveal the quality of the raw milk used in their manufacture. The possibility that methods of analysis which may be acceptable for normal milk may not always yield reliable results when applied to milk which has been altered by high-temperature heat treatment is noted, however. The heating of whey for 2.5 hr. at 116° resulted in an increase in titrable acidity of only about 11 percent of that observed in skim milk, but losses in lactose and increases in lactic acid were similar.

Some relationships between pH, titrable acidity, and the formol titration in milk heated to high temperatures, I. A. GOULD and R. S. FRANTZ. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 5 pp. 387-399, illus. 10).—Whole homogenized milk or skim milk heated at 100° C. for periods up to 8 hr., and at 116° for periods up to 2.5 hr., was examined for acidity changes before and after adding oxalate, for formol titration changes before and after adding oxalate, and for pH changes. Sodium citrate (0.3 percent) and disodium phosphate (0.3 percent) were added to the skim milk in certain of the trials. Titrations were made electro-metrically.

Acidity changes produced by the heat treatments were reduced when the milk was treated with oxalate prior to titration in all milk excepting that containing added phosphate. The oxalate treatment of the phosphate milk, however, resulted in higher titers, the difference being more marked as the heating period progressed. The heating of milk under the conditions of these experiments resulted in a slight, but definite, increase in the formol titration. This increase was appreciably reduced in the normal samples upon the addition of oxalate. In the phosphate samples, it was completely obliterated. The pH changes correlated well with the majority, but not with all of the titrations. Changes in the buffer capacity of milk, as produced either by the addition of salts or through heat, may influence the titration without a similar influence on the pH.

Heating of whey at 116° produced changes which varied from those produced by heating milk. The whey exhibited greater increases in formol titration than did the skim milk from which it was obtained, and the formol titration increase was unaffected by treatment of the whey with oxalate. The comparative slopes of the acidity increase-heating time curves for normal- and oxalate-treated milk indicate that the first acidity increase in milk as detected by titration may be due to salt changes, resulting in an increase in the buffer capacity.

The formation of volatile acids in milk by high-temperature heat treatment, I. A. GOULD. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 5, pp. 379-386, illus. 2).—Lactic acid having accounted for no more than about 5 percent of the total increase in the acidity of skim milk caused by heating the milk at 100° C. or at a higher temperature, as reported in the papers noted above, the author investigated the volatile acid content of the milk as determined by steam distillation.

Redistillation of the steam distillate obtained from skim milk heated previously for 2 hr. at 116° resulted in a curve falling between the formic and acetic acid curves at the start of the distillation, but resembling that obtained from formic acid for the major portion of the distillation period. Under the conditions of this experiment, formic acid constituted 80 to 85 percent of the total volatile acids in the skim milk distillate, a result essentially the same as those much earlier reported by Kometiani.²

Riboflavin content of some animal feeds and some human foods, A. R. KEMMERER and G. S. FRAPS (*Texas Sta. Bul.* 671 (1945), pp 18).—Materials high in riboflavin, containing over 10 p. p. m. of riboflavin, were liver meal 41.5, dried buttermilk 35.4; dried turnip greens 23.5; dried whey 17.2; alfalfa leaf meal 16.2 and 11.9; and dried chicken excrement 11.8 p. p. m. Materials which contained 4 to 10 p. p. m. of riboflavin were alfalfa stem meal, ground peanut hay, sardine meal, sesame oil cake, corn distillers' dried grains, and fish meal. Materials which contained 2 to 4 p. p. m. were beet pulp; corn bran; corn gluten feed and meal; cottonseed meal; hominy feed; linseed meal; meat and bone scraps; milo head chop; oat mill feed; peanut cake; peanut meal and pellets; rice bran and polishings; shrimp meal; soybean meal, cake and pellets; and wheat bran, brown shorts, and gray shorts. Materials which contained less than 2.0 p. p. m., were babassu oil meal; barley; beans; bonemeal; bread; citrus pulp; corn chop; whole corn; Argentine fish meal; grapenuts; kafir; milo mill feed with screenings; kafir chop and meal; milo, whole or meal; oats, whole and meal; peas; tankage; wheat; dried brewers' grains; and rice. Of 12 samples of laying mash, 11 were found to contain the 2 p. p. m. of riboflavin to satisfy the minimum requirements of chickens for egg production for eating purposes, and 8 of them contained over 2.5 p. p. m., sufficient to satisfy these requirements for eggs for hatching. However, only three of the samples contained sufficient riboflavin to meet the recommendations of the subcommittee on poultry nutrition of the National Research Council as to adequacy for the production of eggs for eating purposes, and none met its requirements for the production of eggs for hatching.

Persistence of monochloroacetic acid in fruit juices and carbonated beverages, J. B. WILSON (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 195-200).—The author showed that there was little, if any, loss of monochloroacetic acid when carbonated beverages containing it were stored over a period of 19 mo., when pasteurized or unpasteurized apple juice containing added monochloroacetic acid was bottled and stored for 13 mo., or when canned orange juice and grapefruit juice containing monochloroacetic acid were stored for 30 mo.

A note on yeasts occurring in dessert wines, H. J. PHAFF and H. C. DOUGLAS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 23 (1944), No. 11, pp. 332-333).—The occurrence of but a single species of yeast, *Zygosaccharomyces mellis*, in spoiled dessert wines, and the fact that such spoilage is characterized by the development of sufficient sedimented yeast cells to give the wine an objectionable appearance leaves little doubt that this yeast is capable of growth in dessert wines. The failure of pure cultures of the yeast to grow in either media containing over 12 percent alcohol by volume or in dessert wine is held probably to be due to omission in the laboratory of certain conditions which exist in nature and are responsible for the adaptation of this yeast to life in a high concentration of ethyl alcohol.

Advances in enzymology and related subjects of biochemistry, V, edited by F. F. NORD and C. H. WERKMAN (*New York 3: Interscience Pubs.*, 1945, vol. 5, pp. 268+, illus. 11).—Volume V of this annual review (E. S. R., 92, p. 3) contains the following articles: Physical and Chemical Properties of Tomato Bushy Stunt

² *Milchw. Forsch.*, 12 (1931), No. 4-5, pp. 433-454.

Virus and the Strains of Tobacco Mosaic Virus, by N. W. Pirie (pp. 1-29); The Coagulation of Blood, by E. Chargaff (pp. 31-65); The Amino Acid Decarboxylases of Mammalian Tissue, by H. Blaschko (pp. 67-85); Alcoholic Fermentation of the Oligosaccharaides, by J. Leibowitz and S. Hestrin (pp. 87-127); Pyruvate Metabolism, by E. Stotz (pp. 129-164); Recent Progress in the Biochemistry of Fusaria, by F. F. Nord and R. P. Mull (pp. 165-205); Enzymatic Reactions Involving Nicotinamide and Its Related Compounds, by F. Schlenk (pp. 207-236); and Some Enzyme Reactions on Sulfur Compounds, by C. V. Smythe (pp. 237-247).

The relation of proteolysis to the characteristics of oxidation and reduction in doughs.—II, Some reasons for conflicting interpretations of data, R. M. SANDSTEDT. (Nebr. Expt. Sta.). (*Bakers Digest*, 19 (1945), No. 5, pp. 29-30).—In this second article (E. S. R., 92, p. 326) the author finds that as an outgrowth of some recent studies concerning the action of proteolytic enzymes and of oxidizing and reducing agents in doughs, conflicting conclusions have been drawn, due largely to differences in interpretation of the data. He points out as important reasons for conflicting interpretations: (1) Disregard for the effect of quantity of reagent on the rate of reaction; (2) use of excessive quantities of reagents; (3) too much reliance placed on the appearance of doughs without checking the results by baking; and (4) assuming without evidence that data concerning the action of proteolytic agents on gelatin (or on other proteins) may be used to explain their action on the gluten proteins in doughs or to explain the action in doughs of the natural enzymes of flour. He suggests that in comparing rates of reaction the quantities of reagents used in doughs should bear some relationship to the quantities that give equivalent effects on the properties of the fermented doughs and on the characteristics of the baked bread; and that the quantities used should approximate those which permit the doughs to be punched, molded, and baked.

Mixograph studies and their meaning to the baker, R. H. HARRIS. (N. Dak. Expt. Sta.). (*Bakers Digest*, 17 (1943), No. 4, pp. 13-18, 26, illus. 7).—The author briefly outlines the history of recording dough mixers, discussing their development, features of the modern mixograph, and results obtained with the mixograph. He then takes up the manner in which the data furnished by the recording mixer can be applied for the purposes of the baking technologist.

Farm products: Their utilization as industrial raw materials, O. E. MAY. (U. S. D. A.). (*Chem. and Metall. Engin.*, 51 (1944), No. 10, pp. 102-104, illus. 3).—The author summarizes numerous recent developments in the field of chemurgic utilization of farm products and wastes, gives some indications of probable directions of development, and calls attention to the demands of industry with respect to such materials as considered in competition with inorganic source materials. The new products and processes involved in farm products and wastes utilization as here dealt with are largely the work of the U. S. D. A. Bureau of Agricultural and Industrial Chemistry and of the regional research laboratories.

Industrial oil and fat products, A. E. BAILEY (*New York 3: Interscience Pubs.*, 1945, pp. 735+, illus. 111).—This volume is intended primarily as a text on oil and fat technology; hence the greater part (third and fourth sections) is devoted to a description and discussion of the commercially important oil and fat products and the processes used in their manufacture. In two preliminary sections, the chemical and physical nature of fats and oils is briefly reviewed, and the various fatty raw materials are considered with respect to their composition, characteristics, and availability.

The first section, on the nature of fats and oils, contains an introduction and chapters on the structure and composition of fats and oils, reactions of fats and fatty acids, physical properties of fats and fatty acids, and role of fats in

the diet of man. The second section, on the raw materials for oil and fat products, deals with sources, utilization, and classification of oils and fats; production and consumption of primary fats and oils; and composition and characteristics of the individual fats and oils. The third section, on the industrial utilization of fats and oils, takes up cooking and salad oils; salad dressings; plastic shortening agents; butter and margarine; bakery products and confections; soap and other surface-active materials; paints, varnishes, and related products; and miscellaneous oil and fat products. The fourth and last section describes unit processes in oil and fat technology, in chapters on extraction of fats and oils; refining and bleaching; deodorization; hydrogenation; soap making; fractionation of fats and fatty acids; fat splitting, esterification, and interesterification; polymerization, isomerization, and related processes; and solidification, homogenization, and emulsification. The book has both subject index and author index.

Synthetic rubber from alcohol: A survey based on the Russian literature, A. TALALAY and M. MAGAT (*New York 3: Interscience Pubs., 1945, pp. 298+, illus. 64*).—This book is concerned with a method for producing 1,3-butadiene directly from alcohol, devised by Lebedev, and with plant production of synthetic rubber by processes based upon the principle of the simultaneous catalytic abstraction of hydrogen and of the elements of water with the aid of a mixture of a dehydrogenating and a dehydrating catalyst. Part 1, The Lebedev Process, contains chapters on chemistry of the process and factors influencing the Lebedev catalysis. Part 2, Technology of the S. K. Process, discusses laboratory installation, pilot installation, and industrial installations. Part 3, Polymerization, contains an introduction and chapters on homogeneous and catalyzed thermopolymerization, emulsion polymerization, sodium polycondensation, other methods of polymerization initiation, and technology of sodium polymerization. Part 4, Physicochemical Properties of the Polymer, takes up general properties, structure of the polymer, effects of chemical and physical agents on the solid polymer, properties of solutions and cements, and effect of chemical and physical agents on polybutadiene in solution. Author index and subject index are appended.

The bactericidal and bacteriostatic action of crystal violet, C. E. HOFFMANN and O. RAHN (Cornell Univ.). (*Jour. Bact., 47 (1944), No. 2, pp. 177-186, illus. 5*).—The authors find the bacteriostatic action quite different from the bactericidal action of crystal violet. Above a certain concentration, the dye acts like any other disinfectant. The cells die in logarithmic order and proportionately to the dye concentration ($n = 0.86$). The dye is more toxic to young than to old cells, and its toxicity increases only slightly with an increase in pH. The death rate is independent of the size of the inoculum. This strictly disinfectant action is probably due to the combination of the dye with some indispensable cell constituents. At lower concentrations, the dye does not give a logarithmic survivor curve and is not influenced by cell age or pH or the dye concentration. This unusual effect may be due to the unfavorable oxidation-reduction potential poised by the dye. In this range of lower concentrations, cells usually overcome the dye action and multiply. The dye produces an abnormally long lag period which increases with the dye concentration and may become infinite. Once multiplication of the cells has started, however, it proceeds at a normal rate. The length of the lag phase is inversely proportional to the logarithm of the number of the inoculated cells. It increases with increased oxygen concentration and with increasing pH. Young cells recover more quickly than do old ones. The bacteriostatic effect of crystal violet is due to its property of poisoning the potential in a range unfavorable for cell multiplication.

Effect of increase in acidity on antiseptic efficiency, O. RAHN and J. E. CONN. (Cornell Univ.). (*Indus. and Engin. Chem., 36 (1944), No. 2, pp. 185-187, illus.*

2).—The authors show that benzoic acid, salicylic acid, and sulfurous acid are nearly 100 times as efficient antiseptics in strongly acid solutions as they are in neutral solutions. With benzoic and salicylic acids, only the undissociated acid is antiseptic; the benzoate and salicylate ions appear to have practically no effect on yeast. Multiplication of the yeast was inhibited whenever the undissociated benzoic acid concentration was above 25 mg. per 100 cc. With salicylic acid, the limiting concentration was 4 mg. of undissociated acid per 100 cc. Sulfur dioxide in water dissociates to harmless SO_3^{--} ions and to HSO_3^- ions which inhibit the multiplication of *Bacterium coli* but not of yeast. The yeast is inhibited only by undissociated H_2SO_3 . The rapid death of yeast is brought about by 7 to 8 mg. of undissociated H_2SO_3 per 100 cc.; *B. coli* can tolerate nearly 10 times as much.

The value of statistics in the formulation of chemical methods, L. F. KNUDSEN (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 145–153, illus. 2).—This discussion includes the topics quality control, accuracy v. reproducibility, types of errors, design of experiment to take into account these errors, sampling and its implications, and caution concerning historical background of a method.

[Reports of referees and associate referees on analytical methods] (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), Nos. 2, pp. 231–271, illus. 3; 3, pp. 339–412, illus. 2; 4, pp. 477–558, 581–584).—This volume of the journal contains reports of referees and associate referees as follows, reports from State colleges, experiment stations, and the U. S. Department of Agriculture being indicated as such: Fill of container methods for foods, drugs, and cosmetics, by S. C. Rowe (p. 231); coloring matter in foods, by C. F. Jablonski (pp. 231–232); lactose in milk, by E. R. Garrison (pp. 232–235) (Mo. Expt. Sta.); dried and skim milk (lactic acid), by F. Hillig (p. 235); fish and other marine products, by H. D. Grigsby (pp. 235–237); volatile acids in fish and fish products, by F. Hillig (pp. 237–240); metals in foods, by H. J. Wichmann (pp. 241–245); fluorine, by P. A. Clifford (pp. 246–256); food preservatives and artificial sweeteners, by W. F. Reindollar (pp. 256–257); spices and condiments, by S. Alfend (pp. 258–259); mayonnaise and salad dressing, by S. D. Fine (pp. 260–263); vinegar—detection of glacial acetic acid in vinegar, by R. E. O'Neill and A. M. Henry (pp. 263–271); monochloroacetic acid, by J. B. Wilson (pp. 339–340); vegetable drugs and their derivatives, by F. H. Wiley (pp. 340–342); the assay of ergot, by D. C. Grove (p. 342); phenothiazine, by V. E. Stewart (pp. 343–346); synthetic drugs, by L. E. Warren (pp. 346–352); barbituric acid derivatives, by L. E. Warren (pp. 352–353); phenolphthalein in presence of bile salts, by R. Hyatt (pp. 353–354); quinacrine hydrochloride (atabrine), by H. C. Heim (pp. 354–357); sedormid, by I. Schurman (pp. 357–359); miscellaneous drugs, by C. K. Glycart (pp. 359–360); spectrophotometric methods—determination of quinacrine hydrochloride by absorption spectrophotometry, by J. Carol (pp. 360–365); cosmetics and coal-tar colors, by D. Dahle (pp. 365–366); nail cosmetics—I, Preliminary separation of nonvolatile constituents, by W. H. Naylor (pp. 366–369); buffers and solvents in titanium trichloride titration, by O. L. Evenson (pp. 370–371); malt, by C. Rask (pp. 372–374); diastatic activity of malt, by A. D. Dickson (pp. 374–375), and hops, by F. Rabak (pp. 375–377) (both U. S. D. A.); brewing sugars and sirups, by S. Laufer (p. 378); pH and acidity of beer, by K. Becker (pp. 379–386); sulfur dioxide in beer, by L. V. Taylor (pp. 386–389); color and turbidity in beer and wort, by B. H. Nissen (pp. 389–393); cereal foods (pp. 394–396), and iron and calcium in cereals (pp. 396–404), both by V. E. Munsey; starch in raw and baked cereals, by M. P. Etheredge (pp. 404–412); unfermented reducing substances in molasses, by F. W. Zerbán (p. 477); honey and honeydew honey, by G. P. Walton (pp. 477–480) (U. S. D. A.); waters, brine, and salt, by A. E. Mix (pp. 481–483); iodides in stabilized iodized salt, by L. M. Huntley and J. T. Tripp (pp. 483–493);

adulteration of condensed milk products, by P. B. Curtis (p. 494) (Ind. Sta.); ammoniacal urea and nitrogen salts, by W. B. Griem (pp. 494-495); yeast activity, by H. J. Witteveen (pp. 495-496); microscopic examination of feeds, by A. W. Creswell (pp. 496-499); magnesium and manganese in fertilizers, by J. B. Smith and J. Rynasiewicz (pp. 500-510) (R. I. Sta.); acid- and base-forming quality of fertilizers, by H. R. Allen and L. Gault (pp. 510-516) (Ky. Sta.); calcium and sulfur, by G. Hart (p. 516); plants, by E. J. Miller (pp. 516-517), chlorophyll in plant tissue, by E. J. Benne, D. I. Rose, and C. L. Comar (pp. 517-526), and iron in plants, by E. J. Benne and A. J. Snyder (pp. 526-531) (all Mich. Sta.); soils and liming materials, by W. H. MacIntire (pp. 531-532), and liming materials, by W. M. Shaw (pp. 532-533) (both Tenn. Sta.); vitamins, by E. M. Nelson (pp. 533-534); vitamin B₁, by O. L. Kline (pp. 534-537); ascorbic acid (vitamin C) in citrus fruits and tomatoes, by O. A. Bessey (pp. 537-540); riboflavin (pp. 540-542), and carotene in feeding stuffs (pp. 542-546), both by A. R. Kemmerer (Tex. Sta.); insecticides and fungicides, by J. J. T. Graham (pp. 546-549), fluorine compounds, by C. G. Donovan (pp. 549-554), and disinfectants, by C. M. Brewer (pp. 554-556) (all U. S. D. A.); standard solutions, by R. S. Vandaveer (p. 556); stability of standard sodium thiosulfate solutions, by G. M. Johnson (pp. 557-558); and fertilizers, by G. S. Fraps (pp. 581-584) (Tex. Sta.).

Improved apparatus for moisture determination distillation with acetylene tetrachloride (tetrachloroethane), E. PHILLIPS and J. D. ENAS (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 3, pp. 442-446, illus. 2).—The apparatus described and illustrated is designed for use in carrying out an adaptation of the Bidwell and Sterling distillation method (E. S. R., 53, p. 805) for an immiscible solvent heavier than water, this solvent returning continuously to the distillation flask from below the water column. A feature of the apparatus is a support ring for the distillation flask, mounted upon a sliding sleeve raised by a compression spring which exerts a force sufficient to prevent leakage between the flask and the stopper attached to the distilling column.

Microscopic identification of sodium and potassium by means of their crystalline picrolonates, W. V. EISENBERG and G. L. KEENAN (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 177-179, illus. 1).—A chemical microscopic test for the identification of sodium and potassium as their picrolonates is described, and optical crystallographic constants for differentiating the sodium and potassium salts formed with picrolonic acid are given.

Ca⁺⁺, Ba⁺⁺, Sr⁺⁺, NH₄⁺, Li⁺, Pb⁺⁺, Cu⁺⁺, and Mg⁺⁺ yield precipitates with picrolonic acid and should be removed when testing for sodium and potassium. Interfering ions will affect the form of the crystalline precipitate. Calcium and lithium form very fine wavy trichites; barium, a yellow amorphous precipitate; lead, a yellow flocculent mass of minute needles; and magnesium compact circular masses of minute needles, all unsuitable for optical study. Ammonium and strontium form crystalline picrolonates showing habit and optical properties different from those of sodium and potassium. Copper yields a crystalline precipitate somewhat similar to that of sodium and potassium but can be differentiated by its optical properties.

Microscopic identification of strontium, ammonium, copper, and zinc by means of their crystalline picrolonates, W. V. EISENBERG and G. L. KEENAN (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 3, pp. 458-462, illus. 3).—A chemical microscopic test for the identification of strontium, ammonium, copper, and zinc is described, and optical-crystallographic constants for differentiating the strontium, ammonium, copper, and zinc salts formed with picrolonic acid are recorded.

Identification of monochloroacetic acid as barium monochloroacetate, J. B. WILSON and G. L. KEENAN (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 3, pp.

446-448, illus. 2).—The authors give directions for separating the acid as its barium salt, describe the appearance of the salt under the microscope, and state the two significant refractive indices, which are $n_\alpha = 1.582$ and $n_\gamma = 1.611$, both ± 0.002 , and are frequently shown on the platy fragments.

When applied to water solutions the procedure was successfully used to identify monochloroacetic acid when 10 mg. was present in 100 cc. of solution.

Modification of picric acid method for determination of hydrocyanic acid in white clover plants, J. T. SULLIVAN. (U. S. D. A. et al.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 2, pp. 320-325).—Disintegration of the leaves by grinding, addition of a quantity of linamarase as well as toluene, and incubation in a closed flask for at least 1 day before distillation are advised.

Factors affecting determination of acid- and base-forming quality of fertilizers, H. R. ALLEN and L. GAULT. (Ky. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 171-177).—Lower basicity results may be expected on samples containing more than 500 lb. of calcium carbonate equivalent per ton when a 1-gm. portion and 30 cc. of N hydrochloric acid are used. When determinations of basicity run more than 500 lb. per ton, the residue should be tested for undecomposed carbonate. A temperature of 500° C. was not high enough to volatilize all the nitrogen in the sample, but a temperature of 600° was satisfactory for this purpose. A 0.5 M sodium carbonate with 25 gm. per liter of sucrose was more effective at 500° and at 600° than the molar sodium carbonate with 50 gm. of sucrose per liter. The 0.5-gm. sample seems preferable to 0.25 gm. for determination of basicity of dolomite or calcium carbonate. In sampling, results were duplicated within 10 lb. for coarser-than-20-mesh material up to 100 lb., and within 15 lb. for material of 150 lb. per ton.

An innovation in technic of citrate digestions, W. H. MACINTIRE, H. L. MARSHALL, and T. A. MEYER. (Tenn. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 2, pp. 272-283, illus. 3).—A variance in spot temperatures was found in the water of a citrate-digestion bath and in the lagging temperatures of the contained digestates. Parallel digestions were conducted in an electrically heated water bath and in an electrically heated chamber, well insulated and provided with a device for constant agitation of digestates. The chamber afforded greater uniformity of temperature and induced greater dissolvent action and better reproducibility of citrate-insoluble values than did the official technic for the same digestion period. The dissolvent action of the citrate increased progressively during the 1-hr. digestions at temperatures of 30°, 40°, 50°, 60°, and 65° C. Chamber digestions with constant agitation for periods of 15 and 30 min. proved ample in some instances and inadequate in others. With one exception, a 45-min. digestion was ample when the digestates were agitated continuously.

Dilute hydrochloric acid as a solvent for phosphates with special reference to defluorinated phosphates and other materials used as phosphorus supplements for livestock, D. S. REYNOLDS, W. L. HILL and K. D. JACOB. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1945), No. 4, pp. 559-571, illus. 2).—As a standard procedure, to a 1-gm. sample in a 250-cc. Erlenmeyer flask was added 100 cc. of exactly 0.4 percent (0.1097 N) hydrochloric acid, and the mixture was vigorously shaken in the stoppered flask for 30 sec. The mixture was allowed to digest at 25° [C.] for 1 hr., with vigorous shaking at intervals of 5 min. At the end of the digestion period the undissolved material was filtered off, Whatman No. 5 filter paper or its equivalent being used, and washed with distilled water until the volume of filtrate and washings was 200 cc. Where a precipitate formed in the extract, sufficient hydrochloric acid was added to yield a clear solution, which was then made up to 250 cc. The extracts were prepared in duplicate, and aliquots were boiled 2 hr. or longer to convert meta- and pyrophosphates to the ortho-

phosphate, which was determined by the volumetric molybdate method for fertilizer materials.

Factors that influence the P_2O_5 transitions that occur in ammoniation of superphosphate, W. H. MACINTIRE, H. L. MARSHALL, and R. C. SHANK. (Tenn. Expt. Sta. et al.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 3, pp. 413-425).—The partially C. S. (citrate-soluble) tricalcium phosphate formed in contact with generated solute diammonium phosphate in absence of calcium sulfate at room temperature was rendered less soluble by aging and by elevation of temperature. Almost completely soluble dicalcium phosphate was formed and stabilized in contact with generated solute monoammonium phosphate, "with and without incidence of calcium sulfate." Digestion of suspensions of reagent dicalcium phosphate in contact with solute diammonium phosphate at room temperature induced formation of a relatively insoluble tertiary that became less soluble during aging, whereas the reverse progression occurred in identical systems aged at 90° C. In corresponding systems, the inclusion of calcium sulfate caused disappearance of solute PO_4 and repressed the solubility of the tertiary precipitate at 90° C. Inclusions of calcium sulfate in the experimental concentrated superphosphates resulted in marked decreases in water-soluble phosphate and substantial increases in C. I. (citrate-insoluble) during the curing of the products from both aqueous and gaseous ammoniations. In every comparison of the water-insoluble residues of the cured products, however, the C. I. content was high for the aqueous ammoniation, and the lowest C. I. values were obtained in the absence of component fluorides. The proportion of included sulfate governed the extent of C. I. induced by ammoniation, but there was no effect from variations in manner of introduction or from variance in the form of the sulfate.

Under temperature control, concentrated superphosphates can be ammoniated highly without serious increase in C. I. percentage. The findings are held to support related evidence indicating that development of hydroxyapatite in ammoniated superphosphates is conducive to the subsequent formation of calcium fluorophosphate, or apatite.

In the citrate digestion of the reagent-derived tertiaries, continuous agitation gave C. S. values higher than those obtained by periodic agitation, and double digestions registered substantial increases in C. S. values. Continuous agitation during citrate digestion of the superphosphate-derived tertiaries gave lower C. I. values, as did dual extractions.

The analysis of foods, A. L. and K. B. WINTON (*New York: John Wiley & Sons; London: Chapman & Hall, 1945, pp. 999+, illus. 208*).—"Some of the methods selected after thorough testing have been adopted by American national organizations or are standard in other countries; but others, although developed in laboratories of good repute and published in accredited journals, have yet to run the gauntlet. In the interest of those who are not professional food analysts, apparatus and reagents are briefly treated in the introduction, illustrations of microscopic tissues are given at the beginnings of the chapters, and reaction equations are included in the descriptions of the methods. As practice examples for students, typical methods, listed after the table of contents, are described in explicit detail."

Following an introduction dealing with apparatus, reagents, and results, part 1 takes up general microscopic methods; general physical methods; and general chemical methods, subdivided into chapters on organic elements, constituent groups (determined in three portions), water, protein, fat, nitrogen-free extract, fiber, ash, alcohols, vitamins, natural colors, artificial colors, and chemical preservatives. Part 2 contains special methods for the examination of cereal foods, fatty foods, vegetable foods, fruit foods, saccharine foods, alcoholic beverages, dairy products,

animal foods, alkaloidal products, food flavors, leaven, and salt. A list of references is appended to each chapter, and a detailed combined index of authors and subjects is also provided.

Moisture in potato starch, W. L. PORTER and C. O. WILLIAMS. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 179-194, illus. 6).—From the experimentally determined effects of time and temperature on the loss in weight of potato starch by oven drying, the conditions of drying that give the most nearly reproducible values for moisture content were determined. By use of a Brabender moisture tester it was established that heating to constant weight at temperatures in the range of 135°-145° C. gives reproducible values. By using this basic procedure, it was found possible to modify several of the commonly used methods and to obtain values in agreement with results established by the basic method. These methods were found to be applicable to the determination of moisture in various agricultural products such as leafy vegetables and certain natural rubber-bearing plants, but experience indicated that the optimum conditions of time and temperature must be determined for each particular material.

Detection of decomposition in liquid, frozen, and dried eggs, H. A. LEPPER, M. T. BARTRAM, and F. HILLIG (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 204-223).—The authors found that in liquid and frozen eggs a microscopic count of over 5,000,000 per gram, with determinable quantities of either formic or acetic acid or lactic acid in excess of 7 mg. per 100 gm. of liquid egg, demonstrates the presence of decomposed eggs; and that in dried eggs a microscopic count of over 100,000,000 per gram, with determinable quantities of formic acid and acetic acid over 65 mg. and lactic acid over 50 mg. per 100 gm. (on the dry basis), demonstrates the presence of decomposed eggs. Whenever the taste of dried egg was sour, the bacteriological and chemical results were well above these maxima. Certain types of decomposed eggs can be present in liquid, frozen, or dried eggs without being detected by these bacteriological and chemical methods. The smell test is reliable for establishing a decomposed condition in liquid and frozen eggs in the absence of other criteria.

A 1,10-phenanthroline method for the determination of iron in powdered milk, H. PYENSON and P. H. TRACY. (Univ. Ill.). (*Jour. Dairy Sci.*, 28 (1945), No. 5, pp. 401-412, illus. 2).—A rapid, accurate method for the determination of iron using hydroxylamine hydrochloride, sodium acetate buffer, and 1,10-phenanthroline is described. The ash is taken up with hydrochloric acid (1 + 1) and heated for 5 min. No interference from pyrophosphates, copper, or nickel was observed. In the concentrations found in milk, zinc did not interfere with the color development. An excess of 1,10-phenanthroline is added to take care of any zinc complex that may be present. The reagents used are stable and need not be refrigerated or stored in the dark. The advantages of the use of 1,10-phenanthroline and hydroxylamine hydrochloride are noted. Losses of iron during ashing were not observed. The order of addition of the reagents with respect to that of the sodium acetate buffer was not found to affect the intensity of the color produced.

The variations of the iron content of a batch of commercial powdered milk are given.

Improved dithizone procedure for determination of zinc in foods, O. R. ALEXANDER and L. V. TAYLOR (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 2, pp. 325-331).—The revised procedure involves the wet oxidation of the sample; elimination of lead, copper, cadmium, bismuth, antimony, tin, mercury, and silver as sulfides, with added copper as a scavenger agent; a simultaneous elimination of cobalt and nickel by extracting the metal complexes of a -nitroso-b-naphthol and dimethyl-glyoxime, respectively, with chloroform; extraction of the zinc dithizonate with carbon tetrachloride; transfer of the zinc to dilute hydrochloric acid; and a final extraction of the zinc dithizonate for color measurement.

Conditions for complete acid inversion in analysis of final cane molasses, F. W. ZERBAN, J. E. MULL, and J. MARTIN (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 139-145).—The average blackstrap is completely inverted in 24 hr. at 28° [C.]; heating to 60° for 10 min. does not give complete inversion, and the time must be extended to 15-20 min.; heating to 70° for 8 min. gives a sucrose result checking within less than 0.1 percent with that obtained after inversion for 24 hr. at 28°. These conclusions are to be understood as valid only for an average Cuban or Puerto Rican blackstrap, however, and in some instances the time given for the different temperatures may either be insufficient for complete inversion or cause incipient destruction of invert sugar.

Hexabromide method for detection of small quantities of linolenic acid in animal fats: Detection of horse meat in admixtures with pork or beef, G. K. CROWELL (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 3, pp. 448-451).—This method takes into consideration the solubility of the precipitated hexabromide derivative and prevents the precipitation of fatty acids other than hexabromide fatty acids during the bromination procedure. This was found to be extremely important in that error due to incomplete removal, by washing, of nonbrominated fatty acids is avoided. The use of anhydrous hexabrominated-saturated ethyl ether in brominating and washing samples is necessary owing to the solubility of the hexabrominated derivative.

The melting point of the hexabromide formed from the fatty acids present in horse fat is in accordance with the previously published figures for linolenic acid hexabromide. It is shown that an increased hexabromide value above that found for pork or beef, together with an identification (melting point) of the prepared hexabromide derivative, would constitute sufficient evidence that horse fat or meat was present.

Methods for direct count of microorganisms in citrus products, J. W. STEVENS and T. C. MANCHESTER (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 2, pp. 302-307).—The method developed by Breed and Brew (E. S. R., 35, p. 70) was adapted for citrus juices by the addition of gelatin amounting to 0.25 percent of the dilution used for counting, to permit formation of a film which could be fixed satisfactorily on the slide. In the examination of pectins, 2-percent sols were made up to contain 7 cc. of 60° Brix simple sirup in each 100 cc. A spore-staining method is also described.

Determination of peel oil in citrus juices, J. B. WILSON (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 201-204, illus. 1).—A modified oil separatory trap for the determination of peel oil in citrus fruit juices is described. It is shown that accurate results can be obtained with a 1-l. sample by the use of the new trap. Constant attention is not required during the determination. The distilled oil remains segregated and is not broken up into droplets during the determination. Results can be read off at once after its completion. Data on peel oil recovery by this apparatus are presented, and results obtained by steam-distilling 3-l. and 1-l. samples are compared.

Estimation of caffeine in coffee extracts, G. K. CROWELL (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 168-171).—In examining soluble coffee extracts, the author observed that the caffeine recovery from the brands analyzed by means of the Power-Chesnut method (E. S. R., 85, p. 5), though giving excellent checks on duplicate runs, seemed extremely low, which would indicate either that the labeling was incorrect or that the 8-hr. continuous alcohol extraction failed to remove all the caffeine. He subsequently showed that the latter view was correct.

After the extraction had progressed for a short time, the original fine, powdery material became a gummy, impenetrable mass. After 2 hr. of continuous extraction, a portion of the freshly refluxed alcohol removed from the overflow of the

extractors failed to give a qualitative test for caffeine, indicating that all the caffeine that could be extracted by this procedure was removed within the first few hours. When the residue from the extraction thimble was removed and air dried, cooled in a refrigerator, ground fine in a mortar with the aid of sand, and reextracted, complete recovery by the Power-Chesnut method could be obtained; but in some instances the grinding and reextraction had to be repeated several times.

The author's results indicate that when the tentative Fendler-Stüber and the official (tea) Bailey-Andrew methods (E. S. R., 85, p. 5) are applied to coffee extracts, they give complete recovery of caffeine.

Vanillin from the shells of tung nuts, M. PHILLIPS. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 125-127).—Using 50 gm. of the shells dried at 105° C. and heating this quantity of starting material with 600 cc. of 8-percent aqueous sodium hydroxide and 35 cc. of nitrobenzene for 3 hr. after reaching various selected temperatures (150°-180°), the author found analytically, as the *m*-nitrobenzoylhydrazone, from 2.54 to 3.22 percent of vanillin on the basis of dried shells. He was able actually to isolate vanillin amounting to approximately 1.5 percent of the weight of the shells, using the same quantity of starting material. The vanillin analytically determined to be present in the reaction products amounted to as much as 6.4 percent of the lignin content of the shells.

Iron in stock feeds: Comparison of titrimetric and colorimetric methods, L. S. MARCELLO and C. V. MARSHALL (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 161-165).—The proposed method comprises digestion of the sample by a form of the perchloric acid and nitric acid oxidation method of Gerritz (E. S. R., 75, p. 156), color development by addition of excess of ammonium thiocyanate, and titration with 0.0018 *N* mercurous nitrate to disappearance of the red color, the mercurous nitrate concentration specified being such that 1 cc. of the titrant is equivalent to exactly 1 mg. of ferric iron. As compared with the colorimetric method, this procedure is held to be timesaving, less expensive because no costly apparatus is required, and not eyestraining and fatiguing, as is the colorimetric method.

Microscopic identification of crystalline substances listed in United States Pharmacopoeia XII, G. L. KEENAN (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 1, pp. 153-161).—The significant refractive indices of 90 crystalline substances listed in U. S. P. XII are recorded in two tables for ready reference in determinative work. A brief description of the immersion method employed in the determination of many of these indices is given.

Volumetric determination of alkanolamines in emulsions, J. H. JONES (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 2, pp. 309-317, illus. 1).—A semimicro volumetric method for the determination of alkanolamines in emulsions is described. When an inorganic base is also present, the method may be used to determine the total base. Typical results are given.

Oxidation of alkanolamines by periodate, J. H. JONES (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 3, pp. 462-467).—Various primary and secondary alkanolamines were shown to be quantitatively oxidized in a moderate period of time. The tertiary amines did not react at a significant rate. Equations for the reaction of typical alkanolamines with periodate are given, together with data showing agreement between theory and experimental results.

Preparation of alkanolamine hydrochlorides, J. H. JONES (*Jour. Assoc. Off. Agr. Chem.*, 27 (1944), No. 3, pp. 467-472).—Methods for the preparation and purification of several alkanolamine hydrochlorides are described. Analytical data for the compounds are given. Contrary to earlier reports, these hydrochlorides are not hygroscopic. They have proved useful as reference compounds and for the identification of the amines.

AGRICULTURAL METEOROLOGY

Climatological data for the United States by sections [1944] (*Washington: U. S. Dept. Com., Weather Bur., Climat. Data*, 31 (1944), Nos. 1-12, [about 240 pp., 10 illus. each]; 13, pp. [294], about 45 illus.).—Nos. 1-12 contain the usual brief summaries and detailed tabular statements of climatological data for each State for January to December, respectively. No. 13 summarizes for each State the data for each month of 1944 and for the year as a whole.

Weather and crop yields in New York, E. G. MISNER ([*New York*] *Cornell Sta., A. E.* 527 (1945), pp. 88+).—Detailed data—mostly in tabular form and largely for the 56 yr. 1856-1944—are presented for the State on precipitation in inches and in percentages of normal, temperature in degrees, mean temperature in percentage of normal, frequency of years by percentage of normal precipitation and of normal mean temperature, relation of mean temperature in each month to the precipitation and temperature in other months and of the precipitation in each month to the precipitation and temperature in other months, number of years with temperature and precipitation below normal and normal or above, and yields per acre of different crops.

Highlights of South American weather, R. L. DAY (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 9, pp. 169-172, illus. 6).—A brief presentation of the outstanding features making South American weather so distinct from that of other parts of the world—strong contrasts in the equatorial section, unusual weather conditions in the great Andean range, storm patterns in North and South America, and the rainfall pattern in the equatorial section.

Density changes of native vegetation in relation to precipitation, R. LANG (*Wyoming Sta. Bul.* 272 (1945), pp. 31, illus. 8).—An 8-yr. study of the relationship between precipitation and density of native vegetation was conducted in parts of Converse, Campbell, and Weston Counties, Wyo., where a striking relationship was found between precipitation during any 12-mo. period beginning September 15 and the density of vegetation in the following growing season. The relationship between (1) grass and grasslike plants, (2) forbs, and (3) shrubs and semishrubs did not remain constant. On the short-grass vegetative type the density of perennial grasses had decreased, while the forbs and shrubs had increased. On the cactus-grass type the perennial grasses and shrubs had increased, while the forbs had decreased in density. On the sagebrush-grass type the density of all three groups had fluctuated in about the same proportion as fluctuations in precipitation. On the mixed grass vegetative type there was a tendency for decreased density of forbs, while the shrubs remained relatively constant. On abandoned farm land there was a sharp decrease in forb density and a moderate increase in that of perennial grasses.

The study covered some extremely dry as well as some relatively wet years, and has shown that density decreases of 50 percent or more may be expected from wet to dry years. Abandoned farm land revegetated to perennial grasses very slowly by natural processes, the dominant one nearly 10 yr. after abandonment being needlegrass. Blue grama—the dominant grass on unbroken land—was found on only 2 percent of the plots studied. Three yr. of complete protection from grazing did not materially change the total density of vegetation as compared to grazed areas. There was, however, a slight increase in grass and shrub density and a decrease in forb density on the protected areas; this revealed that, although the total density had not been materially affected by protection, the composition was being slowly changed.

Average and extreme range in degree-day units in the United States, S. S. VISHNER (*Amer. Geophys. Union Trans.*, 26 (1945), pt. 1, pp. 45-48, illus. 2).—

A "degree-day" is one when the average temperature is 64° F. Days which have an average temperature of 54° are sometimes called "11-degree-days," and those with an average temperature of 0°, "65-degree-days." However, instead of calling a single zero-day a 65-degree day, it is here said to have 65 degree-day units. Data along these lines are presented through maps and text.

A study of Northern Hemisphere pressure-center tracks, L. W. SHERIDAN (*Amer. Geophys. Union Trans.*, 26 (1945), pt. 1, pp. 49-57, *illus.* 10).—Rather extensive preliminary investigations of methods of summarizing data taken from the track charts of the Northern Hemisphere of high- and low-pressure centers for 1929-38 were made. During this study it was kept in mind that the final summaries should be of such a form as to serve as a guide for forecasting weather. This preliminary work included the testing of a number of relationships by computing simple linear correlation coefficients, but few were found significant. After various preliminary tabulations of frequency, speed, etc., it was decided to prepare five charts for each month of the year. It was believed desirable from the magnitude of the frequencies observed over a 10-yr. period to have a longer record, as well as to treat the hemisphere as a whole rather than to confine the study to the limited areas which wartime demands made necessary in the present case. Such charts serve to give the forecaster some idea of what may be expected on the basis of past data. The limits of intensities and frequencies shown also offer a guide in making a prognostic chart; e. g., if the lowest pressure observed over a 10-yr. period in a given area is 950 millibars, such knowledge would indicate that extreme caution should be used before placing a center lower—or even as low—on a prognostic chart. Similarly, the charts showing total frequency of centers indicate the frequency that may be expected in any given area. The paths of maximum frequency might give valuable clues to the probable movement of centers, especially if more data were available and larger areas were considered. A further and obviously necessary refinement for such a study would be to subdivide the centers into various types. The charts might also be used in climatic investigations to determine long-range trends in frequency or intensity patterns, or to relate the variations in such patterns to other atmospheric or terrestrial phenomena, or to variations in solar activity.

Some problems associated with the stability of the westerlies, P. F. CLAPP (*Amer. Geophys. Union Trans.*, 26 (1945), pt. 1, pp. 37-44, *illus.* 4).—This study was designed to investigate the deepening and filling of waves in the westerlies as revealed by 5-day mean charts of the pressure distribution at upper levels. On such charts frontal discontinuities are of little significance. Furthermore, the wavelengths of the waves on these charts are usually much longer than those of the usual cyclone wave. Therefore the study was confined to the general theory of the stability of the westerlies, where physical properties change continuously from place to place, rather than to the classical wave theory of cyclones, where physical properties change in a discontinuous fashion at frontal boundaries. Since this investigation was confined to the case of horizontal motion, no energy can be derived from circulation around the isobaric-isosteric solenoids and all energy must be derived from the existing kinetic energy of the westerlies. The author thus concludes that only under extreme conditions will it be possible to transform the kinetic energy of the westerlies into cyclonic vortices. Formulas and other detailed data are presented.

SOILS—FERTILIZERS

Physical and chemical properties of soil profiles of the Burchard and Steinauer series, H. W. SMITH and H. F. RHOADES (*Nebraska Sta. Res. Bul.* 139 (1945), pp. 41, *illus.* 14).—This bulletin presents results of chemical and physical

studies of the Burchard and Steinauer soil series. Chemical and physical properties studied included the plasticity index, hygroscopic coefficient, moisture equivalent, and specific gravity. Volume-weight determinations were made in the horizons of seven profiles. Mechanical analyses were made of two Burchard and two Steinauer profiles. Oxidizable material, pH, and carbonate content were determined for all horizons from the nine profiles. Cation exchange capacity was determined in all horizons of eight profiles. Exchangeable calcium was determined for the noncalcareous samples. Exchangeable sodium and potassium were determined for one Burchard and one Steinauer profile.

Field observations and laboratory data indicate that typical Burchard soils differ from typical Steinauer soils in three important respects. First, the Burchard but not the Steinauer soils have a definite textural B horizon. Second, in the Burchard soils, the organic matter decreases gradually and with fair uniformity of rate to a depth of 35 in., while in the Steinauer soils the amount decreases quite rapidly to a depth of about 10 in. and then decreases very slowly into the lower B and C horizons. Third, in the Burchard soils the pH values indicate slight acidity to a depth of 20 or more inches, with carbonate present at a depth of about 26 in., while the Steinauer soils have pH values of 6.9 or above from the surface downward, with noticeable amounts of carbonate throughout the profile and a marked concentration at a depth of 12 in. Steinauer soils usually occur on steeper slopes than Burchard soils. However, the prediction of the series from the percentage slope alone would be hazardous; the length of the slope and its nature other than grade have greatly influenced soil formation.

Data presented on atypical soils point out some of the more likely variants of uneroded Burchard and Steinauer soils. Where the variant is between typical Burchard and Steinauer, the nature of the adjacent soils plus the slope in the questionable area would be used in deciding upon a series name. True Burchard-Steinauer catenary complexes have been recognized and are being mapped. Variants between Burchard and Carrington soils may be encountered on slopes but would probably be in very narrow bands and thus could be mapped with either Carrington or Burchard soils. Observations by the authors indicate that variants of Burchard and Pawnee soils are unlikely to be encountered in extensive areas. Problems of mapping eroded areas of Steinauer, Burchard, and related soils on the basis of their dominant characteristics are discussed. The distribution of carbonate in the Burchard soils suggests a definite lime horizon. Possibly these soils should be classified as either intrazonal soils or as normal soils of the Prairie-Chernozem transition rather than as nearly mature soils of the Prairie soil group. The classification of the Steinauer and similar soils as Lithosols is questioned by the authors.

Some soil properties related to the sodium salt problem in irrigated soils, R. GARDNER (*U. S. Dept. Agr., Tech. Bul. 902 (1945), pp. 28, illus. 3*).—Laboratory and greenhouse studies are presented for 13 western saline soils to measure some of the physical and chemical changes which result from salinity. The destructive effect of sodium salts on granular structure was found to be not completely reversible following a change from a sodium- to a calcium-saturated system. A floccular rather than a granular state of aggregation resulted from the addition of calcium salts to a dispersed soil. Drying or other mechanical processes were found necessary in addition to the change from sodium to calcium in the clay to restore a granular structure. The effect of mechanical puddling was found to be similar to the effect of sodium salts on soil structure. Green manures improved the fertility of soils high in replaceable sodium but did not restore a granular structure. A scheme of classifying saline soils partly on the basis of electrical conductance, pH, settling volume, rate of wetting by capillary action, and permeability is suggested.

Soil survey of the Dalles Orchard area, Oregon, O. F. BARTHOLOMEW. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 424 (1944)*, pp. 16+, illus. 1).

Effect of contour cultivation on crop yield, runoff, and erosion losses, J. H. STALLINGS (U. S. Dept. Agr., *Soil Conserv. Serv.*, 1945, pp. 12+).—A mimeographed publication giving a summary of results of the effect of contour cultivation on crop yield, runoff, and erosion losses, obtained from the experiment stations of the research division of the Soil Conservation Service in cooperation with the State agricultural experiment stations.

It is concluded that "contour cultivation, when properly carried out, is one of the most effective erosion control measures for cultivated crop land thus far used. It is effective from the standpoint of increasing crop yields, reducing runoff, and in preventing erosion losses. Like other conservation measures, it has its limitations and maximum results may be expected only when used in conjunction with other good farming practices. . . . Factors, such as soil type and soil condition, amount, and intensity of rainfall, the length, irregularity and steepness of slope, all modify the effectiveness of contour cultivation."

Conserving soil and moisture in orchards and vineyards, J. T. BREGGER and G. P. BROWN (U. S. Dept. Agr., *Farmers' Bul. 1970 (1945)*, pp. 30+, illus. 28).—Detailed information on conservation practices that can be used in orchards, with recommendations, is given on contour planting; terracing and terrace outlets; diversions; sod waterways; mulch; vegetative ground cover; tillage—contour and strip cultivation and trashy cultivation; farm ponds and reservoirs; irrigation in orchard soil conservation; application of conservation measures to noncontour orchards; adaptation of conservation practices to fruit and nut species—apple and pear trees, stone fruit, citrus and nut trees, and grapevines and brambles; and assistance through soil conservation districts.

Missouri program of land improvement (*Missouri Sta. Cir. 303 (1945)*, pp. 23, about 20 illus.).—This circular presents a coordinated land-improvement program developed by State and Federal agencies working for the common goal of a more productive land and a secure basis of better living for all. The publication has many illustrations and includes discussion on such topics as holding the soil in place; soil treatments; Missouri adaptation of crops and pastures; acres of principal crops for pasture farming; farm ponds; and forest lands.

Soil microbiology as a field of science, S. A. WAKSMAN. (N. J. Expt. Stas.). (*Science*, 102 (1945), No. 2649, pp. 339-344).—"It can now be definitely recognized that the soil microbiologist is in a position to make important contributions, not only to our knowledge of soil processes and plant growth but also to microbiology, especially microbiol physiology, and to the utilization of micro-organisms for various industrial, public health, and other processes. The soil microbiologist is able to contribute in many ways to man's capacity to survive, by learning to control the activities of injurious micro-organisms and by favoring the processes brought about by the beneficial organisms. The reason why the broader concept 'microbiology' rather than the narrower term 'bacteriology' has been used throughout this discussion is that the soil microbiologist has often to pay as much attention to the fungi as to the bacteria, and occasionally also to the protozoa, the algae, and even the nematodes and other worms inhabiting the soil in large numbers. Only a recognition of all these lower forms of life and their many interrelationships can help to elucidate this complex and important science."

The acid-base condition in vegetation, litter, and humus, I-IV, S. MATTSO and E. KOUTLER-ANDERSSON (*Lanibr. Högsk. Ann. [Uppsala]*, 9 (1941), pp. 1-73, illus. 29).—In the work with which these, the first four papers of the present series, are concerned, the authors departed from the practice of previous investigators in that they made separate determinations of the acids and acidoids as well as of the bases.

I. *Acids, acidoids, and bases in relation to decomposition* (pp. 1-26).—Mature leaves and needles, straw, and green plant materials were studied before and after decomposition for 1 yr. under aerobic and anaerobic conditions, with and without leaching. The materials were examined with respect to changes in their reaction, acidity, and content of "excess base," organic acids, and acidoids. The pH increased rapidly in the aerobic series as a result of a decomposition of the organic acids. The higher the excess base (and organic acids) the greater the rise. Where the bases were low and the leaching intense, there was later a decrease in pH due to the formation of acidoids. In the original material there was a correlation between the excess base and the acids and acidoids, and, in the mature litter, between each of these and the rate of decomposition. There was a linear relationship between the H-ion activity and the acidoid content of the electrodialed mature litter or its decomposed residue.

II. *Acids, acidoids, and bases in relation to soil types* (pp. 27-37).—Paper 2 reports, in part, the observation that the beech is not only higher in pH and bases but also in acidoids than spruce and pine. The beech is lower than spruce and pine in acidity, in organic acids, in the acid : base ratio, and in the pH_a values. Pine is the least basic. Regarding the influence of soil, it was found that beech grown on a Brown earth having a high base status was not only higher in bases but also in acidoids and acids than beech grown on a Podzol. The spruce grown on the Brown earth had a higher pH, was higher in bases and acids, and was lower in acidity and in the acid : base ratio than spruce grown on Podzol; but the spruce grown on the Brown earth was less basic than the beech grown on the Podzol (true for vegetation-layer samples only). As in the case of beech, the pH_a values (ultimate pH, i. e., that of electrodialed material) seemed to be unaffected by the soil. These values were found to be related to the acidoid content.

In the soil itself, the organic acids decreased downward in all the profiles having a low base status, i. e., the Podzols. In the Brown earths, the organic acids were high in the F (förrna) layers as well as in V (vegetation). Their accumulation was always accompanied by an increase in bases. There was a general downward increase in acidoids. The beech had a pH minimum in F_1 whereas spruce and pine showed maxima in this layer. The F layers in the Brown earths were found richer in bases than the F layers in the Podzols.

III. *Acidoid formation in relation to base status* (pp. 38-56).—According to paper 3 raw humus increases its acidoid content by aerobic decomposition in the presence of calcium carbonate. Treatment of the humus with alkali under sterile conditions increases its acidoid content. Electrodialed elm and birch leaves reduce their acidoid content in aerobic decomposition. "Sour" humus has a low and "mild" humus a high acidoid content. Acid vegetation such as the Podzol flora has a lower acidoid content than plants of higher base status. The highest acidoid content has been found in seaweeds growing in a medium which represents the highest base status.

The functions of the acidoids are discussed and an explanation of the relationships observed is offered. The mechanism of acidoid formation is considered to provide the plant with an automatic control of its acid-base balance and with a power to adjust itself to its external environment.

IV. *The strength of the acidoids and the relation to nitrogen* (pp. 57-73).—The H-ion activity of the electrodialed F and H (humus) samples in 1 : 10 suspensions in N.KCl solution was found to be directly proportional to the acidoid content. Exceptions to this rule are those abnormally high in nitrogen. Dilutions of one and the same sample yield H-ion activities which are proportional to the square root of the concentration of the undissociated acidoid, a behavior similar to that of weak acids. The apparent strength of the acidoids and the

exchange acidity of the electrolyzed samples increase with an increase in the acidoid content. The nitrogen content bears a definite relationship to the acidoid content except in some F samples which are abnormally high in nitrogen. The acidoids increase, however, faster than the basoids, so that the isoelectric point is lowered with an increase in the acidoid content. The chemical fixation of ammonia in a nonexchangeable form is likewise proportional to the acidoid content. The apparent strength of the acidoids and the exchange acidity in samples originally high in nitrogen or those ammoniated are both relatively low. The splitting off of nitrogen by the nitrite treatment increases the apparent strength of the acidoids and the exchange acidity.

It is concluded that the amphoteric complex in litter and humus is of the same nature, the latter being directly derived from the former by a continuous series of changes. These changes consist primarily of an increase in the acidoid and nitrogen (basoid) content which certain chemical forces tend to keep in a definite relationship to each other.

The effect of different concentrations of nutrient supplies in sand cultures on the elemental composition of the express sap and the corn plant, S. S. OBENSHAIN. (Va. Expt. Sta.). (*Va. Acad. Sci. Proc.*, 1944, p. 74).—Nitrogen, phosphorus, potassium, calcium, and magnesium were used in sand cultures at various levels to determine the effect of nutrient level on the composition of the corn plant. In each case there was a positive and significant relationship between the increase of the element in the nutrient solution and its content in both the sap and the tissue of the plant. An increase of the nitrogen in the cultural solution was accompanied by an increase of the magnesium in the plant tissue; an increase of phosphorus by a decrease of the potassium in the sap; an increase of potassium by an associated increase of phosphorus in the sap and a decrease of magnesium and calcium in both the sap and tissue; an increase of calcium by a lowering of the content of phosphorus in the sap and tissue and the magnesium content of the tissue; and an increase of magnesium by a decrease in the phosphorus content of the sap and the calcium in the tissue.

The persistence of ammonia nitrogen against leaching, E. A. CARELTON. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 9, p. 781).—Ammonia nitrogen added as sulfate of ammonia persisted against leaching over winter in a heavy acid soil such as Dunkirk silty clay loam. The rainfall from October to April was 20 in., with 5.76 in. measured as runoff from an adjacent plot similarly cropped.

Statistical treatment of various concentrations of ammonia liquors as a source of nitrogen in greenhouse experiments, W. HUSMANN and R. E. O'BRIEN. (Va. Expt. Sta.). (*Va. Acad. Sci. Proc.*, 1944, pp. 74-75).—Oats were used as a test crop in greenhouse work to determine with how many parts of water ammonia liquor, 26 percent nitrogen, had to be diluted to insure an economical return for the nitrogen applied. In these tests 0, 1, 2, 5, 10, and 20 parts water were added to 1 part ammonia liquor; the liquid was put in 0.5-in.-deep furrows and covered with soil; and 0.25 and 0.50 gm. nitrogen per 2-gal. pot were applied. No significant differences in the yield were obtained in the 0.25 gm. nitrogen per pot series. The 0.50 gm. nitrogen per pot series showed greater increases in yield in the more diluted ammonia applications, 1 : 10 and 1 : 20, the differences being highly significant. None of the ammonia liquor applications were superior to sulfate of ammonia.

Agronomic relationships of sodium cyanide, M. M. MCCOOL. (*Contrib. Boyce Thompson Inst.*, 13 (1945), No. 10, pp. 455-461, illus. 1).—In laboratory tests, sodium cyanide was found to raise the pH of Norfolk and Leon sands and Culvers and Lordstown soils. The addition of 50 and also 100 p. p. m. of sodium cyanide to Gloucester loam increased the rate of nitrate formation, and 200 and 400 parts

at first retarded the rate but later increased it. Increase in the ferrous iron in several soils resulted from the addition of sodium cyanide to them. Hydrocyanic acid was released when sodium cyanide was added to soils. The rate of loss and also the total quantity given off were greatest in the Gloucester loam with a low water content, and least where the water content was high. The rate and amount of the release from Leon sand did not vary significantly until the water content of the soil approached the saturation point. The loss from Webster, Podunk, and Weatherfield soils and Leon sand did not vary significantly when the water content was similar.

Fertilizer value of sodium cyanide, M. M. McCool (*Contrib. Boyce Thompson Inst.*, 13 (1945), No. 10, pp. 479-485).—In greenhouse studies with corn, lettuce, tobacco, and white mustard as the indicator crops, it was found that sodium cyanide delays seed germination somewhat, leaches less readily from the soil than sodium nitrate, and increases growth when added to soils deficient in nitrogen. Sodium cyanide was less effective on soils deficient in nitrogen than was sodium nitrate.

The release of exchangeable and nonexchangeable potassium from different soils upon cropping, R. F. Chandler, Jr., M. Peech, and C. W. Chang. ([N. Y.] Cornell Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 9, pp. 709-721, illus. 3).—Ladino clover was grown in the greenhouse in Honeoye silt loam, Dunkirk silty clay loam, Mardin silt loam, Gloucester loam, Wooster silt loam, Palmyra gravelly sandy loam, Chenango gravelly silt loam, Palmyra gravelly silt loam, Bath silt loam, Ontario loam, and Honeoye gravelly silt loam, for periods ranging from 271 to 391 days. From four to six crops were harvested from each of the different soils, and the amount of potassium removed by the tops and roots of each crop was determined. The exchangeable potassium content of the soil was determined at the start and at the time of each crop harvest. The amount of nonexchangeable potassium released was calculated by subtracting the decrease in the exchangeable potassium content of the soil from the total amount of potassium removed by the crop.

Upon continuous cropping, the exchangeable potassium content of the different soils decreased very rapidly at first, then more gradually until a certain level was reached, when the potassium-supplying power of the soil was determined largely by the rate at which the nonexchangeable potassium was converted into the exchangeable form. The dry weights and the potassium content of the plants of the successive crops were closely associated with the amount of exchangeable potassium in the soil. The potassium content of the plants decreased upon continuous cropping. Symptoms of potassium deficiency appeared on the clover leaves when the potassium content of the plants fell below 0.8 percent on the oven-dry basis. Of the 11 different soils studied, Honeoye silt loam, Chenango gravelly silt loam, and Ontario loam released large amounts of nonexchangeable potassium; whereas Mardin silt loam Gloucester loam, and Honeoye gravelly silt loam released only small amounts of nonexchangeable potassium upon continuous cropping. These results are related to crop responses to potassium under field conditions. The relative significance of the exchangeable and the nonexchangeable forms of potassium in determining the potassium-supplying power of soils is discussed.

Phosphate fixation by soil minerals.—IV, General, A. T. Perkins. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 48 (1945), No. 2, pp. 209-217, illus. 5).—An extension of the review and discussion of the data presented on phosphate fixation in papers published by Perkins and King (E. S. R., 92, p. 339).

The nature of the phosphates dissolved by various soil extractants, G. S. Fraps and J. F. Fudge. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 7, pp. 532-541).—The solubility of several phosphates and of 34 soils of low basicity in 0.2 N nitric acid, 0.75 N hydrochloric acid, 0.002 N sulfuric acid, and

0.52 N acetic acid in 10-percent sodium acetate was determined. Pure calcium phosphates were completely soluble in all extractants. Rock phosphates were almost completely soluble in 0.75 N hydrochloric acid and 0.2 N nitric acid, less soluble in 0.002 N sulfuric acid, and practically insoluble in 0.52 N acetic acid. Apatite was not completely soluble in the different extractants; the solubility was influenced by the strength of the acid and the period of extraction. The quantity of phosphoric acid dissolved from the soils by 0.52 N acetic acid was from 20 to 40 percent of that dissolved by the mineral acid extractants. Fixation of dissolved phosphoric acid from the acetic acid was about the same as from water but was less from the other solvents.

The amount of phosphoric acid removed by corn from the 34 soils was related to the phosphoric acid dissolved by the solvent. The correlation coefficients for the relation between the phosphoric acid removed by the crops and the phosphoric acid dissolved by the solvents were much larger for the mineral acids. Chemical methods determine the easily soluble phosphate but not the availability of the soil phosphates. Any interpretation of the chemical data secured in terms of availability should be aided by agronomic data.

The value of different phosphates for various Texas soils and grasses, as indicated by pot experiments, J. F. FUDGE and G. S. FRAPS (*Texas Sta. Bul.* 672 (1945), pp. 25).—The effect of different phosphates on grasses grown in different soils under greenhouse conditions was investigated. Yields of black finger-grass and Bermuda grass varied widely under different soils not receiving phosphate fertilizers, depending on the active phosphoric acid in the soils. When superphosphate was added, the yields were more nearly uniform.

The effect of the superphosphate depended on the soil, being greater where the soil was more deficient in active phosphoric acid. The application of limited amounts of superphosphate increased the yield to a greater extent than it increased the percentage of phosphoric acid in the grasses. The yield and percentage of phosphoric acid in the grasses was closely related to the amount of active phosphoric acid in the soils. When 14 species of grasses were grown on the same unphosphated soil, considerable differences occurred among the yields of grass. When superphosphate was added, the differences were much smaller. This indicates that the differences were chiefly due to differences in the capacity of the grasses to utilize soil phosphates.

One application of superphosphate at the beginning of the season produced larger yields with greater increases in percentage of phosphoric acid than the same amount of phosphoric acid added in two applications. Small applications of superphosphate usually produced large increases in yield but small increases in the percentage of phosphoric acid in the grasses. As the quantity of superphosphate was increased, the effect on the yield was less but the effect on the percentage of phosphoric acid in the grasses was greater. Liberal applications of superphosphate produced large yields of dry matter containing good percentages of phosphoric acids. Applications of ground rock phosphate increased yields in a few cases, but the increases were not nearly as great as those for superphosphate. Ground rock phosphate, even when applied in large quantities, usually had little effect upon the percentage of phosphoric acid in the grasses. Phosphoric acid in ammonium phosphate, calcium metaphosphate, defluorinated rock phosphate, and basic slag applied to a slightly acid, phosphorus-deficient Lufkin fine sandy loam was nearly as available as that in 20-percent superphosphate. Phosphoric acid added in finely ground rock phosphate or in soft rock phosphate with colloidal clay was no more available than that in ordinary ground rock phosphate.

Field experiments with alkylation-acid superphosphate, K. D. JACOB and W. H. ARMIGER (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 4, pp. 281-286).—As shown by field experiments in Connecticut, Iowa, Maine, Mary-

land, Michigan, and New Jersey superphosphates made, respectively, with clear sulfuric acid and with spent sulfuric acid from the manufacture of high-octane gasoline by the alkylation process, had similar effects on the growth of alfalfa, barley, oats, oat hay, potatoes, silage corn, sweet corn, Sudan grass, sugar beets, and wheat.

Agronomic value of alkylation-acid superphosphate as indicated by greenhouse and laboratory experiments, E. V. MILLER and K. D. JACOB. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 36 (1944), No. 4, pp. 274-280, illus. 3).—Superphosphates of which one was made with clear sulfuric acid and the other with spent sulfuric acid from the manufacture of high-octane gasoline by the alkylation process had practically identical effects on the growth of German millet, Korean lespedeza, and Detroit Dark Red table beets in Evesboro loamy sand and Chester loam soils under greenhouse conditions, even when they were applied at rates as high as 2,000 lb. of total P_2O_5 per acre.

At the same rates of application, these two superphosphates had similar effects on the pH values of the Evesboro soil under millet in the greenhouse experiments and on the nitrification of ammonium sulfate in laboratory experiments with the same soil.

Sulfur deficiency in soils, W. CROCKER (*Soil Sci.*, 60 (1945), No. 2, pp. 149-155).—Sulfur is required in the synthesis of proteins and of a number of other essential or important organic compounds. It undoubtedly is needed in considerable quantities in a number of deficient soils in the United States and other countries, especially in regions distant from industrial and population centers, where relatively little sulfur is furnished by the air. Any permanent fertilizer system that does not include the application of a sulfur carrier is deemed sure to result in sulfur-hungry crops in some rural regions.

The importance of peanuts left in the soil in the interpretation of increases in yield due to sulfur treatments, R. W. BLEDSOE, H. C. HARRIS, and F. CLARK. (Fla. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 9, pp. 689-695).—Six sulfur dusting experiments were conducted with Florida Runner peanuts at Gainesville, Fla., using the usual rate of sulfur application. In another experiment, sulfur dust was applied on the foliage or soil at different times and rates throughout the summer. In general, sulfur treatments did not materially affect the total yield of peanuts. The results indicate that due to the fruiting habit of the runner peanut, yield records should include nuts retained on vines, nuts left in soil, and the amount of shrivels as an index of maturity in order to evaluate properly the complete effect of treatment on peanut yields.

The geochemical background of minor-element distribution, V. M. GOLDSCHMIDT (*Soil Sci.*, 60 (1945), No. 1, pp. 1-7).—This is a review and general discussion comprising the topics cosmic frequency and evolution; planetary evolution of the earth—primordial differentiation; fractional crystallization of silicate magmas, ionic radii; isomorphous substitution in minerals of igneous rocks; weathering and the cycle of sediments—ionic potential; and oxidation and reduction.

Production, composition, and value of poultry manure, J. W. WHITE, F. J. HOLBEN, and A. C. RICHER (*Pennsylvania Sta. Bul.* 469 (1944), pp. 42+, illus. 3).—This bulletin represents comprehensive research on poultry manure and covers information on the following points: Purpose, nature, and extent of present poultry manure studies; methods of sampling; preparation of samples for analysis; analytical data and methods of analysis; moisture content of fresh poultry manure; rate of production of hen manure and turkey manure; feed consumption and manure produced; composition of fresh hen manure, fresh turkey manure, old hen manure, and old turkey manure; actual losses of nitrogen and organic matter from old manure; nature of the nitrogen in fresh hen manure; ammonia nitrogen contents of fresh hen and turkey manures and old hen manure; experiments on conservation

of nitrogen in hen manure; discussion of results of laboratory experiments; tonnage and value of Pennsylvania poultry manure; production and monetary value of poultry manure produced by 100 birds, based on 3 systems of management; crop-producing value of hen manure; nature of field plot experiments; and poultry manure compost. The practical importance of poultry manure is illustrated by the fact that the annual production in Pennsylvania contains 20,780 tons of nitrogen, equivalent to that in 129,875 tons of nitrate of soda or 98,952 tons of sulfate of ammonia. The phosphoric acid (P_2O_5) produced amounts to 13,478 tons, equivalent to that contained in 67,390 tons of 20-percent superphosphate. The total potash (K_2O) content of this poultry manure is equivalent to 6,599 tons, or that contained in 10,998 tons of 60-percent muriate of potash. An indication of the monetary value is revealed by the fact that, based on the present system of management, the poultry manure recoverable from the dropping boards and from floor litter is valued at \$2,339,758, or a recoverable value of \$7.86 per ton.

Fertilizer recommendations for North Carolina, 1944-45 (*North Carolina Sta. Agron. Inform. Cir. 138* (1944), pp. 8+). A mimeographed circular giving fertilizer recommendations for alfalfa, corn, cotton, cowpeas, potatoes, kudzu, sericea and annual lespedeza, meadow, pastures, peanuts, small grains, soybeans, sweetpotatoes, tobacco and vegetable crops.

Analyses of commercial fertilizers, manures, and agricultural lime, 1944, C. S. CATHCART (*New Jersey Stas. Insp. Ser. 17* (1945), pp. 29).—Statistical data are presented on commercial fertilizers, fertilizer materials, and agricultural lime sold in New Jersey.

AGRICULTURAL BOTANY

Recent advances in the plant sciences, W. F. LOEHWING (*Kans. Acad. Sci. Trans.*, 48 (1945), No. 2, pp. 119-133, illus. 4).—A review, with 21 references.

Lehrbuch der Botanik: Morphologie der Blütenpflanzen—das Pflanzenreich in systematischer Anordnung [Textbook of botany: Morphology of the flowering plants—the plant kingdom in systematic arrangement], O. SCHMEL and A. SEYBOLD (*Leipzig: Quelle & Meyer*, 1944, vol. 1, 52. ed., pp. 400+, illus. 502).—Of the illustrations in this textbook, 96 are colored plates.

Handbook of practical bacteriology: A guide to bacteriological laboratory work, T. J. MACKIE and J. E. MCCARTNEY (*Baltimore: Williams & Wilkins Co.*, 1945, 7. ed., pp. 720+, about 25 illus.).

Index to manual of methods for pure culture study of bacteria, edition of 1944-45 (*Pure Cult. Study Bact.*, 13 (1945), No. 3, pp. 8+).

A simple method for preparing corn meal agar, L. AJELLO (*Mycologia*, 37 (1945), No. 5, pp. 636-637).

[Abstracts of bacteriological papers] (*Jour. Bact.*, 50 (1945), No. 1, pp. 121, 122, 123, 124).—The following are included: Antifungal Properties of Antibiotic Substances, by H. C. Reilly, A. Schatz, and S. A. Waksman, and The Effect of Antibiotic Substances Upon Bacteriophage, by D. Jones (both N. J. Expt. Stas.); Another Nonmodulating Legume [*Maackia chinensis*], by J. K. Wilson (Cornell Univ.); and The Genus *Achromobacter* and the Genus *Flavobacterium*, by R. S. Breed (N. Y. State Sta.).

Transformations of iron by bacteria in water, R. L. STARKEY. (N. J. Expt. Stas.). (*Jour. Amer. Water Works Assoc.*, 37 (1945), No. 10, pp. 963-984, illus. 15).—The iron bacteria comprise some of the most important fouling organisms, since they not only produce troublesome accumulations of cell material but also still greater quantities of ferric hydrate. The morphology, physiology, and the mechanism of fouling in the groups of iron bacteria are described. Discussions are also presented of transformations of iron by nonspecific bacteria, the sulfur bacteria

as fouling organisms, and the sulfate-reducing bacteria. In conclusion, the special methods of study for the iron bacteria are outlined. There are 33 references.

Active enzyme preparations from bacteria, G. KALNITSKY, M. F. UTTER, and C. H. WERKMAN. (Iowa State Col.). (*Jour. Bact.*, 49 (1945), No. 6, pp. 595-602, *illus.* 1).—A semimechanical adaptation of the glass-grinding method of preparing bacterial cell-free extracts is described; it involves passage of a paste of bacteria and powdered glass between concentric cones of heavy glass. The inner cone is revolved by a motor while the outer one is held firmly in place. After grinding, the resulting paste is extracted with buffer solution or water and the extract freed of glass, intact cells, and cell fragments by centrifugation.

The influence of pH upon the growth-factor requirements of bacteria, D. R. DOEDE (*Yale Jour. Biol. and Med.*, 17 (1945), No. 5, pp. 595-610, *illus.* 6).—The pH of the culture medium had a marked influence on the growth factor requirements of the bacteria studied, viz, *Staphylococcus aureus*, *Shigella paradysenteriae* Sonne, and *Lactobacillus casei*. The detailed results indicate that the pH and composition of the medium and the strain and previous history of the organism are four closely linked variables that must be controlled in any nutritional or analytical work involving the growth factor requirements of bacteria.

Investigation of the existence and nature of reserve materials in the endospore of a strain of *Bacillus mycoides* by an indirect method, G. KNAYS. (Cornell Univ.). (*Jour. Bact.*, 49 (1945), No. 6, pp. 617-622).—The endospores of strain C₂ washed five times in distilled water germinated normally in a solution of glucose (0.2 gm. + 100 cc. water) without added N. When this solution was buffered with potassium phosphate (0.2 gm.) at about pH 7, germination was followed by growth and sporulation. There was no tendency for germination in a solution of KNO₃ (0.2 gm. + 100 cc. water) with or without potassium phosphate (0.23 gm.) unless glucose was added. It is concluded that endospores of this strain contain relatively large amounts of a N-containing reserve not suitable as a source of energy, and that they contain no reserve material for that purpose. Endospore suspensions in solutions of glucose or, particularly, of glucose + KNO₃ reach a minimum pH much below that reached by vegetative cells similarly suspended. New evidence is presented to show that endospores are formed by a healthy cell facing starvation; the question of a minimum concentration of nutrients for sporulation is discussed.

Carbon dioxide utilization in the synthesis of acetic acid by *Clostridium thermoaceticum*, H. A. BARKER and M. D. KAMEN. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 31 (1945), No. 8, pp. 219-225).—The authors conclude that the "acetic acid fermentation" of glucose by *C. thermoaceticum* involves a partial oxidation of the substrate to 2 moles each of acetic acid and CO₂, followed by reduction and condensation of the CO₂ to a third mole of acetic acid. This is the third species of *Clostridium* shown to use CO₂ in this way.

Antibacterial properties of yeasts, *Fusarium* sp., onion, and garlic, C. W. CARPENTER (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 49 (1945), No. 1, pp. 41-67, *illus.* 9).—Following a review (38 references) of association and antagonism of micro-organisms and of the antibacterial properties of yeasts and yeastlike organisms, the author presents the results of his search for an antibacterial substance effective against gram-negative rod bacteria. A simple technic used in this study for detecting antibiotic substances is described. *Torulopsis utilis* and its varieties *thermophila* and *major* and—to a lesser degree—certain true yeasts inhibited not only *Staphylococcus aureus* but also the gram-negative *Pseudomonas aeruginosa* and *Escherichia coli* in vitro. In those cases where yeast and *Torulopsis* cells were planted on the plates, the inhibition of the above bacteria was found to depend on the presence of sugar in the medium. Culture solutions of the yeasts or yeastlike organisms often inhibited growth by these bacteria in the absence of sugar in the medium—due to accumulation of antibiotic substances in the solutions. The

rapid evolution of an acid or acids accounted in part for the observed inhibitory activity toward these bacteria. When yeast cells were planted on plates of the test bacteria in media containing sugar, sufficient growth of the yeast occurred even at 37° C. to produce inhibition zones. Inhibition of the bacteria comparable to that by the yeasts and yeastlike organisms was induced in vitro by succinic acid-borax buffer solution at pH 3.5, as well as with solutions of various other acids.

Preliminary clinical tests indicated that yeast-culture solution diluted with an equal amount of sterile 5-percent dextrose solution—applied topically for purulent infections—constitutes a dynamic means of inhibiting growth of *P. aeruginosa*, *S. aureus*, and *E. coli* and probably also many other organisms intolerant of an acid medium; acid solutions and the acid buffers similarly used were essentially static. Such a dynamic culture of *T. utilis major* has been used by local and service physicians with success. The possible mechanism of these results are discussed in the light of the literature.

Fusarium oxysporum var.—parasitic on the common pricklypear—inhibited the growth of *S. aureus* in vitro in a way similar to *Penicillium notatum*—apparently the first observation of the antibacterial activity of a *Fusarium* against a human pathogen. The antibiotic properties of onion and garlic observed in this study have been reported by various investigators. Garlic vapors were found lethal to *S. aureus* and *E. coli* and bacteriostatic to *Pseudomonas aeruginosa*; they were also lethal to honeybees, green-bottle flies, blowflies, and soldier flies (*Hermetia illucens*). The progress already made in the field of microbial antagonism encourages studies of chemical means by which various organisms employ offense as a weapon of defense, successfully compete with one another or dominate their environment, and survive. Superimposed planting of materials on poured agar plates of pathogenic bacteria and the Oxford cylinder method offer techniques for discovering additional sources of antibiotic substances.

The inactivation of antibacterial agents and their mechanism of action, C. J. CAVALLITO, J. H. BAILLY, T. H. HASKELL, J. R. MCCORMICK, and W. F. WARNER (*Jour. Bact.*, 50 (1945), No. 1, pp. 61–69).—The effects of time of reaction, relative concentrations of reactants, and type of sulfhydryl compound on the rate and degree of inactivation of mercuric chloride, penicillin, pyocyanine, and the antibacterial principles of garlic and smaller burdock are presented. It is postulated that a large class of antibacterial agents acts by reacting with the sulfhydryl groups of enzymes, and that the differences in the antibacterial effects of various agents depend, among other factors, on their ability to come in contact with the essential sulfhydryl groups.

Penicillin.—V, Mycological aspects of penicillin production, K. B. RAPER and D. F. ALEXANDER. (U. S. D. A.). (*Jour. Elisha Mitchell Sci. Soc.*, 61 (1945), No. 1–2, pp. 74–113, illus. 14).—In this installment (*E. S. R.*, 93, pp. 409, 410), the authors report a detailed study of natural variation with respect to penicillin production in four selected high-yielding cultures. Variants of the Fleming culture of *Penicillium notatum* characterized by progressively reduced spore production and decreased exudate formation were isolated. Up to a certain point, reduced sporulation was accompanied by an increased capacity to produce penicillin in surface culture; beyond this point, production dropped off as spore formation was further reduced. White nonsporulating strains were characterized by low yields. Strain NRRL 832—used for producing penicillin in submerged culture—was relatively stable. Variants differing appreciably in cultural aspects were isolated but none proved outstandingly better producers than the parent stock, though some less productive variants have been observed. The stock culture of *P. notatum* (NRRL 1950) has proved stable in ordinary laboratory culture, but an ultraviolet-induced mutation has been reported which produced substantially increased penicillin yields in surface culture; this strain is characterized by somewhat reduced spore production and limited exudate formation. As with the Fleming culture, very light-sporing

variants produce low yields of penicillin. *P. chrysogenum* (NRRL 1951) proved most unstable, and substrains producing substantially increased yields of penicillin in surface and submerged culture were isolated. One—representative of the most productive type—was characterized by colonies of altered appearance, reduced spore production, and atypical spore-bearing structures. Very light-sporing substrains gave somewhat reduced penicillin yields. Methods for maintaining stock cultures at maximum levels of penicillin productivity are presented. There are 43 references.

"Fissibactericidal" nature of penicillin action, S. W. LEE, E. J. FOLEY, and E. R. CALEY (*Nature* [London], 156 (1945), No. 3950, p. 49).—A comment on the point brought out in some of the recent literature that penicillin works preferentially—or solely at low concentrations—on those bacteria in the growth phase or undergoing fission, with brief comment on its significance.

Antifungal properties of antibiotic substances, H. C. REILLY, A. SCHATZ, and S. A. WAKSMAN. (N. J. Expt. Stas.). (*Jour. Bact.*, 49 (1945), No. 6, pp. 585–594, *illu.* 3).—The authors conclude from a study of the antifungus action of antibiotic substances from micro-organisms and of certain synthetic compounds that antibiotic substances vary greatly in their antifungus effects; some, like gliotoxin and actinomycin are very active, while others, like chaetomin and streptomycin, have very little activity. Selection of an antibiotic for chemotherapy depends not only on the relative activity of the substance itself but also on its toxicity to animals; hence a substance like actinomycin, which is active but also highly toxic, is eliminated from practical considerations, whereas another like streptothricin, which is not so active but also is not very toxic, deserves consideration. Of seven antibiotics tested for antifungus properties, only two proved worthy of consideration for practical purposes, viz, gliotoxin and streptothricin. The antifungus activity of an antibiotic comprises both fungistatic and fungicidal effects. Certain unsaturated ketones, to which some of the antibiotics belong, were found to possess very strong antifungus properties. There are 15 references.

The effect of sulphanilamide and other bacteriostatic drugs on the growth of moulds, D. SNOW and P. S. WATTS (*Ann. Appl. Biol.*, 32 (1945), No. 2, pp. 102–112, *illu.* 15).—Some molds—mainly species of *Aspergillus* and *Penicillium*—were tested for reactions to bacteriostatic drugs. These fungi exhibited a high specificity in their reactions to different concentrations, *Aspergilli* proving more susceptible than *Penicillia*. Most species included in the *A. glaucus* group were inhibited by 125 p. p. m. of sulfanilamide, sulfonamide E. O. S., or propamidine. Similar concentrations of sulfapyridine, sulfamezathine, sulfaguanidine, and phenamidine were only slightly inhibitory. *A. versicolor* and *A. sydowii* showed very similar reactions to the drug concentrations; this is in keeping with their morphological relationships. In general, the *Penicillia* were unaffected by small concentrations (1/2,000th or less) and were only partially inhibited by the higher concentrations (up to 1/125) of sulfonamide E. O. S. Propamidine proved most effective against *Penicillia*, though not all species were susceptible. Some of the molds were slightly stimulated by low concentrations of the drugs. No differences in fungistatic effects of sulfonamide E. O. S. were apparent between pH 4 and 8. Different strains of the same species showed different degrees of resistance or susceptibility to the drug concentrations. The fungistatic action of sulfonamide E. O. S. at 250 p. p. m. was annulled by 4 p. p. m. of *p*-aminobenzoic acid; that of propamidine in a synthetic medium was not annulled by adding this acid.

A thermostabile, fungistatic factor from *Escherichia coli*, S. WIEDLING (*Nature* [London], 156 (1945), No. 3955, p. 204).—The author found that the colon bacillus (*E. coli*) produces a thermostabile substance which reduces the rate of growth of *Penicillium notatum* and thus the production of penicillin, without actual destruction of the penicillin itself.

Viridin: A highly fungistatic substance produced by *Trichoderma viride*, P. W. BRIAN and J. C. MCGOWAN (*Nature* [London], 156 (1945), No. 3953, pp.

144-145).—Besides the production of gliotoxin previously known, the authors found some strains of this mold forming another substance which they call "viridin." This was characterized by a remarkably high fungistatic activity against species of *Botrytis*, *Fusarium*, *Trichothecium*, *Cephalosporium*, etc.

Antibacterial substances from plants collected in Indiana, D. W. SANDERS, P. WEATHERWAX, and L. S. McCLUNG (*Jour. Bact.*, 49 (1945), No. 6, pp. 611-615).—The results are reported of a preliminary survey of antibacterial substances in a series of 120 or more plant samples collected during the summer of 1944; the juices of the plants—or particular portions of them—obtained by a Carver hydraulic press were tested for inhibitory activity against *Bacillus subtilis* and *Escherichia coli*, using the Oxford cup technic. Representatives (1 to 50 specimens) of 51 plant families were included. Although about a tenth of the specimens exhibited some degree of inhibitory activity against one or both test organisms, no sample gave exceptionally high values. A marked stimulation of growth of the test organism was evident in many samples.

Revision of the genus *Coelomomyces*, parasitic in insect larvae, J. N. COUCH (*Jour. Elisha Mitchell Sci. Soc.*, 61 (1945), No. 1-2, pp. 124-136, illus. 15).—The author presents a historical account—with résumé of the species previously named—and describes five new species from Georgia: *C. dodgei* and *C. quadrangulata* on *Anopheles* spp., *C. psorophorae* on *Psorophora ciliata*, *C. pentangulata* on *Culex erraticus*, and *C. uranotaeniae* on *Uranotaenia sapphirina*. This fungus genus is believed not to have been previously reported in the Western Hemisphere. A study of living *C. dodgei* and preserved material of this and the other species confirmed the lack of cell walls on the mycelium. The resting sporangia, their dehiscence, and the structure of the zoospore suggest a relationship with the order Blastocladales. However, because of the naked mycelial threads—a unique condition in the true fungi—and the obligate parasitism in insect larvae, it seemed advisable to place these fungi in a new family—Coelomomycetaceae—of that order. There are 23 references.

Selenophoma on grasses, II, R. SPRAGUE and A. G. JOHNSON. (Oreg. Expt. Sta. coop. U. S. D. A. and N. Dak. Expt. Sta.). (*Mycologia*, 37 (1945), No. 5, pp. 638-639).—In this installment (E. S. R., 83, p. 641) the fungus genus is emended to include also species with somewhat obtusely pointed spores, other characters agreeing. *S. obtusa* n. sp. is described, and two new combinations are made.

Species of *Synchytrium* in Louisiana.—II, Species of Louisiana *Synchytrium*, M. T. COOK. (La. State Univ.). (*Mycologia*, 37 (1945), No. 5, pp. 571-575, illus. 1).—This installment (E. S. R., 93, p. 590) records five species found in the vicinity of Baton Rouge; three are described as new.

The significance of zygospore character in *Polyphagus euglenae*, A. F. BARTSCH (*Mycologia*, 37 (1945), No. 5, pp. 553-570, illus. 23).—This study is concerned primarily with the clarification of a controversy as to the relationship and taxonomy of smooth and spiny zygospore races of *P. euglenae* which occur primarily as parasites on various species of *Euglena*. The spiny form was found identical in part with *P. euglenae* as originally described, and a revised diagnosis is given it. The smooth form proved identical with *P. euglenae minor* and is rediagnosed and raised to specific rank as *P. laevis* n. comb. The process of conjugation was fundamentally similar in both species.

Additions to the Uredinales reported for Peru, G. B. CUMMINS. (Ind. Expt. Sta.). (*Mycologia*, 37 (1945), No. 5, pp. 609-618, illus. 5).—Included among the rust fungi reported are five new species.

Two new genera of rusts on Bignoniaceae, B. B. MUNDKUR and M. J. THIRUMALACHAR (*Mycologia*, 37 (1945), No. 5, pp. 619-628, illus. 8).—*Mehtamyces* n. gen., with *M. stereospermi* n. comb., and *Santapauella* n. gen., with two new species, are described.

The Boletineae of Florida with notes on extralimital species.—II, The Boletaceae (Gyroporoideae), R. SINGER (*Farlowia*, 2 (1945), No. 2, pp. 223-303, illus. 13).—A continuation of the series previously noted (E. S. R., 93, p. 129).

Marine algae associated with upwelling along the northwestern coast of Baja California, Mexico; E. Y. DAWSON (*Bul. South. Calif. Acad. Sci.*, 44 (1945), No. 2, pp. 57-71, illus. 14).

Plant life of the Pacific world, E. D. MERRILL (*New York: Macmillan Co.*, 1945, pp. 295+, illus. 256).—"An attempt is made in this book to cover a vast region, extending from the Aleutians in the north to Hawaii, the Marquesas Islands, and the Galápagos in the east, westward across the Pacific to include all of the Malay Archipelago and the Papuan region as far to the south as New Caledonia, as well as, with brief and partly bibliographic notes, the islands adjacent to eastern Asia, from the Kuriles to Formosa and Hainan. . . . In considering what to include and what to exclude, the first decision made was to confine the species discussed to those of extraordinarily wide geographic distribution and, again, those that are the most common ones. The second decision was to utilize the available space for generalized treatments of certain definite types of vegetation in the mass and various correlated subjects as detailed in the text." F. Osborn, in the foreword, says that "this unusual book is one of a series describing the natural history and peoples of the Pacific Ocean and of its innumerable islands, large and small. . . . The author . . . has created an embracing and over-all view of the subject, harmonious in structure, expressed in broad overtones, yet supported by adequate detail to bring to the reader a clear understanding of the plant life of these far-flung islands."

Plantas medicinales, aromáticas, o venenosas de Cuba [Drug, aromatic, and poisonous plants of Cuba], J. T. ROIG Y MESA (*Habana: Min. Agr.*, 1945, pts. 1, pp. 448, illus. 21; 2, pp. 449-872, illus. 18).—A manual giving the taxonomy, common names, habitat, geographic distribution, botanical distribution, uses, and bibliography of the plants considered.

Juniperus virginiana, *J. horizontalis*, and *J. scopulorum*.—V, Taxonomic treatment, N. C. FASSETT. (Univ. Wis.). (*Bul. Torrey Bot. Club*, 72 (1945), No. 5, pp. 480-482, illus. 2).—Studies in this section (E. S. R., 93, p. 689) were based on material in seven herbaria, supplemented by mass collections from localities representing nearly the whole range of *J. virginiana*, much of the eastern part of the range of *J. scopulorum*, and a number of localities of *J. horizontalis*. The three species and four varieties are described, one of the latter being new. A key is provided.

Agropyron japonicum, an untenable name, A. A. BEETLE. (Univ. Calif.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 4, pp. 319-321).—The nomenclature of this grass species is revised as follows: *A. hackelianum* (Honda) n. comb. for *A. japonicum* Honda var. *hackelianum* Honda, and *A. hackelianum* var. *japonicum* (Honda) n. comb. for *A. japonicum* Honda.

The vegetable characters of the bamboo genus *Phyllostachys* and descriptions of eight new species introduced from China, F. A. McCLURE. (U. S. D. A. et al.). (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 9, pp. 276-293, illus. 3).

Annual *Phlox* species, E. WHITEHOUSE (*Amer. Midland Nat.*, 34 (1945), No. 2, pp. 388-401, illus. 2).—"In the course of a study of the annual *Phlox* species several new entities had to be described and several new combinations made. It is the purpose of this paper to place these on record."

Posição actual da sistemática dos linhos Portugueses [Present systematic position of Portuguese flaxes], D. R. DE CASTRO (*Bol. Soc. Broteriana*, 2. ser., 19 (1944), No. 1, pp. 223-232).

Notes on plants of central Pennsylvania, H. A. WAHL. (Pa. State Col.). (*Rhodora*, 47 (1945), No. 554, pp. 41-46). The author records the occurrence of

some plants, not previously reported from the State, that reach a limit of their present distribution in this region, or that are otherwise noteworthy because of their distribution.

Flora of the Mount Hamilton Range of California: A taxonomic study and floristic analysis of the vascular plants, H. K. SHARSMITH. (Univ. Minn.). (*Amer. Midland Nat.*, 34 (1945), No. 2, pp. 289-367, illus. 10).

Right-angle grid system for mapping plant distribution, E. M. KERN (*Ann. Missouri Bot. Gard.*, 32 (1945), No. 3, pp. 283-286, illus. 3).—Unless there is a simple easily executed method for obtaining an exact sample of plant distribution, the problem of mapping large heavily populated areas is very difficult. The usual geographic system of right-angle grids was applied by the author to the distribution of *Taraxacum palustre vulgare* and *T. laevigatum* and their hybrids in a selected area; the results are here briefly described and illustrated.

Ecological classification of cover types, S. A. GRAHAM (*Jour. Wildlife Manag.*, 9 (1945), No. 3, pp. 182-190).—"The cover map is an essential tool without which no manager of wild lands would attempt to operate. Nevertheless cover maps and cover mapping technics vary so greatly that the map used by one group may be almost unintelligible to another. . . . This discussion of the Michigan system of classification for cover mapping is presented in the hope that others may also find the scheme useful. Should it stand test under various conditions, it may lead to greater uniformity of cover mapping. More likely it may serve as a starting point from which, through discussion, a universally acceptable system may be developed by persons interested in cover mapping."

Ecological and biochemical characters of *Betula kirghizorum* Saw.-Rycz. resulting from the plant's adaptation to soils impregnated with salts, I. A. KRUFENIKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 47 (1945), No. 1, pp. 64-66).—This birch was found to be typical of species thriving on soils with a high content of readily soluble sulfates and chlorides. A number of morphological and physiological characters also testified to its salt adaptation, viz, a high succulence of the leaves; dense pubescence of the young shoots, tassels, peduncles, and even of the cuttings; high osmotic pressure of the cell sap; intense accumulation of water-soluble substances in the tissues; and high water content of the leaves.

A quantitative study of the interaction of bacteriophage with *Rhizobium* using the technique of poured plates, J. KLECZKOWSKA (*Jour. Bact.*, 50 (1945), No. 1, pp. 81-94, illus. 8).—The phage used came from a *Rhizobium* strain producing nodules on peas, which were used for most of this study. The successive phenomena occurring when the phage was added to a culture of the host organism were followed quantitatively via plaque counts of phage particle numbers obtained from plates in which phage and bacteria had been mixed with melted agar medium before it was poured. The occurrence of resistance to phage among natural strains of *Rhizobium* and the development of resistant dissociant forms were also studied. When suspensions of phage and live susceptible bacteria were mixed, a constant percentage of the phage particles became attached to the bacteria. Dead and live bacteria that were resistant to attack by the phage attached to themselves a percentage of the phage particles, which decreased with increasing phage concentration. When added to a young liquid culture of bacteria, the phage commenced to multiply within 45 min. and continued to do so until the culture was cleared and no further bacterial lysis occurred. The final concentration of phage particles reached was independent of the initial dose but depended on the initial supply of bacteria. The final phage particle numbers were greatly affected by the age of the bacterial culture when infected with phage. When a cleared culture of phage and susceptible bacteria was kept for some 5 to 6 days, it was found that bacterial growth might recommence; this secondary growth consisted of susceptible bacteria or of a new dissociant strain resistant to the phage. The repopulation of the previously lysed culture by

susceptible bacteria growing in the presence of phage was made possible by the appearance, during the lysis process, of some substance protective against phage attack. The resistant dissociants resembled the parent bacteria antigenetically and were as effective in N fixation within the host legume. They maintained their phage resistance after culture in the laboratory up to 2 yr.; they were also readily produced in soil cultures of bacteria treated with phage. When aseptically grown clover was infected with a pure culture of a *Rhizobium* strain susceptible to phage, resistant variants appeared in the nodules in the absence of phage. Among the spontaneously occurring strains of *Rhizobium* tested, only a small proportion of those of pea or clover nodule bacteria (10 to 15 percent) proved susceptible to the phage strain studied. The bearing of the results on the probable effects of phage in the soil is considered. There are 21 references.

The production of plaques by *Rhizobium* bacteriophage in poured plates and its value as a counting method, J. KLECZKOWSKA (*Jour. Bact.*, 50 (1945), No. 1, pp. 71-79, illus. 3).—The phage here studied was derived from garden soil surrounding the roots of peas and first grown on pea nodule bacteria; the quantitative study was done via plaque counts, using a poured-plate technic. Statistical examination of the method indicated that the modified plaque technic could be so standardized as to make possible reliable estimates by which two or more phage suspensions could be compared. Plaques produced by this method developed in the agar by lysis of the minute bacterial colonies formed therein. These colonies ceased to be susceptible to phage attack after about 24 hr. of incubation at 25° C., thus limiting the plaque size to the volume filled by phage diffusion within this time. Both the number and size of the plaques were affected by the agar concentration, composition of nutrients in the medium, temperature of incubation, and age of bacterial suspension used for plating.

Inoculación de las semillas de leguminosas con bacterias radicícolas (*Rhizobium leguminosarum* Frank), II, J. MARCILLA ARRAZOLA, J. AGUIRRE ANDRÉS, and J. M. XANDRI TAGÜENIA ([Spain] *Bol. Inst. Nac. Invest. Agron.* No. 12 (1945), pp. 229-283, illus. 14; Fr., Eng., Ger. abs., pp. 279-281).—The results are presented of inoculation tests with specific commercial preparations of *Rhizobium* on garden pea, broadbean, common vetch, and European yellow lupine. No significant results were obtained in the field tests. The tests in pots appeared to indicate that the seeds, or more probably the air, carried sufficient inoculum to initiate nodule formation on the roots of the first three of the above plants—species under general cultivation in Spain—but not on the yellow lupine, which is not grown in the area involved in the investigation. The authors discuss the conditions under which plants not grown in the vicinity and those under general cultivation there may need inoculation with nodule bacteria.

Relation of bacteria to vitamins and other growth factors, W. H. and M. S. PETERSON. (Univ. Wis.). (*Bact. Rev.*, 9 (1945), No. 2, pp. 49-109).—This comprehensive review (472 references) considers the responses of bacteria to growth substances, the interchangeability of growth factors, structural specificity of compounds (thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, *p*-aminobenzoic acid, and biotin), synthesis of growth factors, bacteriological assays for growth factors, and their destruction and function.

Nutritional studies of representatives of five genera in the Saprolegniaceae, A. J. WHIFFEN (*Jour. Elisha Mitchell Sci. Soc.*, 61 (1945), No. 1-2, pp. 114-123).—The nutritional requirements of *Saprolegnia ferax*, *Achlya flagellata*, *Thraustotheca clavata*, *Dictyuchus monosporus*, and *Aphanomyces stellatus* were surveyed. All five grew in a vitamin-free medium and showed no increased growth on adding any one of nine vitamins; evidently these fungi are able to synthesize all their required vitamins. The growth requirement of organic S in the medium was satis-

fied by cysteine, cystine, glutathione, and methionine. Inorganic N was unavailable for growth, but peptone, casein, and a number of amino acids were excellent sources. The only C compounds important to the nutrition of the five species were glucose, maltose, starch, and glycogen. Glucose was the only source of C available to *D. monosporus*. A pH range of 4 to 6 and a phosphate concentration of 0.005 M were optimum for all these fungi. Observations were also made on the relation between composition of medium and production of zoosporangia and oogonia.

The inhibition of the growth of yeast by thienylalanine, V. DU VIGNEAUD, H. McKENNIS, JR., S. SIMMONDS, K. DITTMER, and G. B. BROWN. (Cornell Univ.). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 385-394, illus. 4).—"The addition of thienylalanine to a medium adequate for good growth of *Saccharomyces cerevisiae* caused marked inhibition of growth which was prevented by phenylalanine. Thienylalanine, when added to the diet of the young rat, was incapable of supporting growth in lieu of either phenylalanine or methionine. The synthesis of thienylalanine was reinvestigated and improved in regard to both yield and convenience."

Contribution to the analysis of the theory of flowering of plants, M. C. ČAJLACHJAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 44 (1944), No. 8, pp. 348-352, illus. 2).—The author's experiments with *Perilla* spp. and *Chrysanthemum indicum* led to the conclusion that flowering and the processes contributing to it are associated with phenomena of a regulatory nature and do not depend directly on the ratio of nutrient substances. The formation of hormonal flowering substances in plants of several short-day types is believed, however, to be related in some way to the presence of a large amount of N compounds and a relatively low content of carbohydrates.

Preliminary observations on the translocation of synthetic growth substances, M. G. FERRI (*Contrib. Boyce Thompson Inst.*, 14 (1945), No. 2, pp. 51-68, illus. 3).—The synthetic growth substances indolebutyric, naphthaleneacetic, indoleacetic, and 2,4-dichlorophenoxyacetic acids, applied as solutions to the soil of potted tomato and *Cleome* plants, were absorbed and transported upward sufficiently to induce root formation on leaf cuttings taken some time after treatment. When lanolin preparations of synthetic growth substances are applied to stems of tomato plants, the amount absorbed and transported upward to the leaves may also be enough to induce root formation. The upward movement of these growth substances was not stopped by a ring of dead tissues in the middle of the stem; they also moved upward when applied to the killed base of tomato stems. In both cases roots were induced above the base of petioles—evidence of a high concentration effect; thus the movement is independent of the activity of living cells. No movement of synthetic growth substances was detected on leafless *Hibiscus* cuttings when a segment of wood was removed for a distance of 5.5 cm. from the base and the bark alone was dipped into the solution for a distance of 2 cm. When the bark was removed and the wood was left alone for the same distance, the movement was even more intense than when both wood and bark were present. In all these cases a basal segment of about 6 cm. was cut off after treatment. A band of pure lanolin prevented a possible external rise by capillarity. Indolebutyric and naphthaleneacetic acids and the K salts of both were employed. When all treatments were statistically analyzed together, the effect of treatment was evident on cuttings with wood alone but not on cuttings with wood and bark. Thus the bark itself not only failed to transport but also in some way decreased the amount of growth substance transported via the wood. It is suggested that when the bark is removed some chemical enters through the lateral walls of the wood and moves upward through vessels which, being plugged at the base, would not be utilized if the impermeable bark were present at the region exposed to the solution. These results support the idea of upward translocation of solutes in the xylem.

Methods of rating the root-inducing activity of phenoxy acids and other growth substances, A. E. HITCHCOCK and P. W. ZIMMERMAN (*Contrib. Boyce Thompson Inst.*, 14 (1945), No. 1, pp. 21-38, illus. 7).—A list of the 63 phenoxy compounds tested in 1943 is presented, together with the average number of roots induced on cuttings of *Ligustrum ovalifolium*; the results of these tests were described only briefly in a previous report (E. S. R., 93, p. 586). Of the phenoxy acids used in 1943, 18 were retested in 1944, using a larger number of replicated treatments. The relative order of activity and the relation between structure of acid and root-inducing activity were essentially the same in both years' tests. The group ranking of 12 of the active acids was about the same by Friedman's method of ranks and the analysis of variance. Only two of the acids—2,4,5-trichlorophenoxyacetic and α -(2,4,5-trichlorophenoxy)-propionic acids—were equivalent in activity to α -naphthaleneacetic acid. The dichlorophenoxy and most of the monochlorophenoxy acids were intermediate in activity. α -(2,5-Dimethylphenoxy)-propionic acid and α -(2-chlorophenoxy)-propionic acids were lowest in activity. The loss of information attending the use of the method of ranks is apparently not serious in this type of test and is considerably compensated for by the simplicity and time saving element of the method.

The preparation of some substituted phenoxy alkyl carboxylic acids and their properties as growth substances, M. E. SYNERHOLM and P. W. ZIMMERMAN (*Contrib. Boyce Thompson Inst.*, 14 (1945), No. 2, pp. 91-103).—Detailed and generally applicable directions are presented for preparing substituted phenoxy alkyl carboxylic acids, and several previously unreported substituted phenoxyacetic, propionic, and butyric acids are reported, with their melting points and effects on plant growth substances. Solubilities in water at $20^{\circ} \pm 1^{\circ}$ C. are given, along with the method of obtaining them for several substituted phenoxy alkyl carboxylic acids. Detailed directions are also given for testing the compounds as plant growth substances. The findings indicate that halogen atoms or methyl groups are most important in lending activity for cell enlargement to the phenoxy alkyl carboxylic acids; the halogens were generally more effective than the methyl groups. The 2, 3, and 4 positions in the benzene ring are those in which the substituents exert their greatest influence. There are 39 references.

Further tests of the use of the methyl ester of alpha-naphthaleneacetic acid for inhibiting the sprouting of potato tubers, F. E. DENNY (*Contrib. Boyce Thompson Inst.*, 14 (1945), No. 1, pp. 15-20, illus. 1).—In further tests (E. S. R., 88, p. 602), four potato varieties were stored at 12.5° C. from October 19 and 20, 1944, to April 2, 1945, in the presence of different concentrations of the vapor of this chemical. When treatments were applied by impregnating narrow strips of paper with the methyl ester and distributing the shredded paper among the tubers, sprouting was inhibited by use of 100 mg. of chemical to 1 kg. of tubers, and nearly so by 50 mg., but at 25 mg. considerable sprout development occurred. When 100 mg. of chemical to 1 kg. of tubers was incorporated into varying amounts of shredded paper, it was found that the amount of paper could be varied at least over the range of $\frac{1}{4}$ to $\frac{1}{16}$ lb. of paper per bushel of tubers treated. When application was by incorporating the chemical into either talcum powder or garden soil sifted to pass a 60-mesh sieve, sprouting was inhibited by use of 45 mg. of the methyl ester to 1 kg. of tubers, but not by 15 mg. or less. Previous results had indicated that 25 mg. could be used successfully. The tubers of lots treated with methyl ester at the rate of 100 mg. or 50 mg. to 1 kg. in shredded paper, or with 45 mg. in talcum or garden soil, were in firm condition without excessive shrinkage. Some evidence was found that for overwinter storage the temperature should not be much higher than that used in these tests. At the end of the experiment samples of tubers showed only traces of reducing sugar in the juice, and slices of these tubers furnished potato chips of good color.

Synergistic effects of three chemicals in the treatment of dormant potato tubers to hasten germination. F. E. DENNY (*Contrib. Boyce Thompson Inst.*, 14 (1945), No. 1, pp. 1-14, illus. 1).—Although ethylene dichloride and CCl_4 are much less effective than ethylene chlorohydrin in hastening germination of dormant tubers, they produce an effect at a much lower concentration. An effective combination of these three chemicals was obtained by mixing 7 parts by volume of ethylene chlorohydrin, 3 parts of ethylene dichloride, and 1 part of CCl_4 ; this mixture was named "rindite." Tubers of three varieties and two sizes were treated at intervals after harvesting with varying concentrations of rindite and of each of its three constituents separately, and the average time for emergence of sprouts for each chemical in each lot was noted. Graphs show the relation between the amount of each chemical used and the germination response. Since there was no volume change on mixing the components the amount of each which was taken when a given amount of rindite was used could be calculated. Interpolations on the graphs demonstrated that the gain in germination time due to rindite was greater than the sum of the gains due to the action of its separate components. Two methods of obtaining the sum of the effects of these components were used. Data from nine tests were combined by expressing each germination time as a percentage of the control for that test and averaging the results for each chemical. An empirical equation which allowed computing the average germination time for each of the concentrations of chemical was obtained. Gains due to rindite and to each of the three components as calculated from these equations showed a greater gain with the amount of rindite used than that due to the sum of the gains from the corresponding amounts of the separate components. Some evidence was obtained that this extra gain due to rindite over that expected from the effect of the components taken separately may have been due to an effect of ethylene chlorohydrin in increasing the permeability of the intact tubers to ethylene dichloride and to CCl_4 . If the dictionary definition of synergism as "cooperative action of discrete agencies such that the total effect is greater than the sum of the two effects taken independently" is accepted, these findings as a whole support the view that synergistic effects were obtained with the chemicals used.

Cómo viven las plantas [How plants live], A. S. COLLA (*Buenos Aires: Editorial Losada, 1945, pp. 190, about 75 illus.*).—The main sections of this volume consider the physiology of the cell, of nutrition, and of growth.

Diurnal potentials in the maple tree. H. S. BURR (*Yale Jour. Biol. and Med.*, 17 (1945), No. 6, pp. 727-734, illus. 4).—The existence of recurring phenomena in plants and animals has been commonly observed; in general, this rise and fall of activity has been associated with metabolic and growth processes in many plants. In the summers of 1942-43, diurnal rhythms in the standing potentials from the maple tree were observed and have been continued as one phase of a 10-yr. study of the factors significantly related to the changing potentials. The evidence thus far obtained makes it quite plain that in a growing tree there are variations in the living process which possess electrical correlates. The 24-hr. rise and fall in potential seems, in general, to characterize the month as well as the season of the year. The standard pattern, moreover, would appear to differ significantly during the period of the new moon from that during the full moon. While, undeniably, internal factors must play a major role in the daily variations, the evidence points to the very real possibility that external factors are also involved. Of all the external factors examined, the phase of the moon appeared to be the only one exhibiting any degree of correlation. This does not necessarily mean a direct effect of the moon; it is quite possible that both the tree and the moon are activated by some more basic factor. Nevertheless, it should not be forgotten that the rise and fall of the tide are believed to be directly attributable to the lunar cycle, and it is therefore believed not impossible that this cycle produces in some

yet undiscovered way the "tides" in the tree. Furthermore, since the standing potential in both plants and animals seems to bear a significant relation to growth and development and since growth in trees is in part a matter of hydration, it may eventually turn out that the effect of the lunar cycle on the growth of the tree is as direct as on the tide level.

Shoot-root ratio and moisture relations, L. J. GIER (*Kans. Acad. Sci. Trans.*, 48 (1945), No. 2, pp. 205-208, illus. 2).—This paper describes briefly the results of a series of experiments on the relation between the shoot-root ratio in tobacco and tomato plants and one environmental factor—the soil moisture content.

Some chemical factors influencing the distribution of aquatic plants in Minnesota, J. B. MOYLE (*Amer. Midland Nat.*, 34 (1945), No. 2, pp. 402-420).—The Minnesota aquatic flora can be separated on the basis of water quality tolerance and preference into three major groups, viz, the soft-water, the hard-water, and the alkali- or sulfate-water floras. Within these three, subgroups can be constructed on the basis of the chemical tolerance of the individual species. The waters of the State are classified on the basis of the chemical data from 225 bodies of water and the correlated distribution of the more common species of aquatic plants. Although the soft-water flora is more characteristic of waters with a total alkalinity below 40 p. p. m., a number of species range into harder waters in situations where the pH remains low, suggesting that pH is a more important limiting factor for this group of plants than the dissolved mineral content of the water. Experimental growth of *Lobelia dortmanna*—a typical soft-water species—showed that hard waters with a high pH and alkali waters definitely inhibit its growth. The hard-water flora consists of a large and varied group characteristic of waters with a total alkalinity of 90-250 p. p. m. and a sulfate-ion concentration less than 50 p. p. m. Most of the hard-water species make a poor growth in or are lacking from waters with a total alkalinity of less than 30 p. p. m.; although 50 p. p. m. is the upper limit of sulfate-ion toleration for some of the hard-water species, others range into waters with concentrations as high as 300 p. p. m.—apparently the upper limit of tolerance for nearly all the hard-water species. The concentration of sulfate salts seems more effective in limiting distribution than that of the carbonate salts. The alkali- or sulfate-water flora is largely limited to Minnesota waters with a total alkalinity greater than 150 p. p. m., a sulfate-ion concentration greater than 50 p. p. m., and a pH of 8.4-9.2. This flora is characteristically developed in waters with a sulfate-ion concentration greater than 125 p. p. m. Experimental growth of *Ruppia* suggests that hard and soft carbonate waters are not toxic to it, but that in such waters the plants are unable to gain sufficient nutriment for successful growth. Although water chemistry appears to be the most important single factor influencing the general distribution of aquatic plants in Minnesota, field observations revealed that the type of bottom soil and the physical nature of the body of water greatly influence the local distribution of a species within its range of chemical tolerance. Experimental growth studies with *Lemna minor* suggest that even free-floating vegetation depends on the fertility of the bottom soil for successful growth. There are 39 references.

Minor elements in plants, and some accumulator plants, W. O. ROBINSON and G. EDINGTON. (U. S. D. A.). (*Soil Sci.*, 60 (1945), No. 1, pp. 15-28).—Up to the present, about 60 elements have been positively identified in plants. The authors of this critical review (40 references) are concerned only with those minor elements that occur in plants in sufficient amount to permit of fairly accurate quantitative determination. The minor elements in plants may be divided roughly into the essential and the nonessential. If only those most important from the plant nutritional standpoint are considered, there would appear to be no very striking examples of accumulating relatively large quantities of any (except Mn); the same is true of the major elements. The relatively few known cases of plants

accumulating relatively large quantities of minor elements are here considered under the heading of the element accumulated, viz, Al, As, Ba, B, Co, Cu, F, I, Mn, Mo, rare earths, Se, Si, V, and Zn.

Aluminum in soils, plants, and animals, G. E. HUTCHINSON (*Soil Sci.*, 60 (1945), No. 1, pp. 29-40, illus. 1).—Aluminum occupies a somewhat anomalous position among the biological elements, in that it is a very common and important constituent of the inorganic materials of the biosphere but a rare and usually unimportant constituent of living matter itself. This critical review (69 references) considers this element in soils, vascular plants, and pteridophytes, its metabolic significance and its excess as an ecological factor in plants, and aluminum in animals.

Boron in plant life—a brief historical survey, J. W. SHIVE. (N. J. Expt. Stas.). (*Soil Sci.*, 60 (1945), No. 1, pp. 41-51).—This survey summarizes published material (46 references) relating to the discovery and distribution of B in plants and soils, B as a toxic and as a stimulating agent, its indispensability for plants, the nature of B-deficiency effects, and the relation of B to other elements in plant nutrition.

Influence of chlorine on plants, A. R. C. HAAS. (Calif. Citrus Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 1, pp. 53-61).—The influence of Cl on plants depends on the nature of the plant, the growth medium, and the climatic conditions. This review (71 references) takes up the determination of Cl, the Cl content, Cl as a fertilizer, tolerance of plants to it, its toxicity, and the morphological and physiological effects of Cl.

Cobalt and nickel in soils and plants, R. L. MITCHELL (*Soil Sci.*, 60 (1945), No. 1, pp. 63-70).—Following the presentation of a brief geochemical and ecological background, the author reviews (26 references) pertinent published studies of Co and Ni in soils and plants.

Copper and plant growth, A. L. SOMMER. (Ala. Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 1, pp. 71-79).—The author reviews (59 references) the earlier work arising from the observed stimulating effects of Cu in connection with the use of bordeaux mixture, studies with solution cultures, the symptoms of Cu deficiency in plants and soils, the effects of Cu on culture media in which plants are grown, and the functions of Cu within the plant.

Fluorine in soils, plants, and animals, H. H. MITCHELL and M. EDMAN. (Univ. Ill.). (*Soil Sci.*, 60 (1945), No. 1, pp. 81-90).—F is a minor element in the plant and animal kingdoms in the sense that, with few exceptions, it occurs only in minute amounts in the tissues, as well as because it has not been found to serve any well-defined function. It is important in plant, and particularly in animal, nutrition because of the harmful effects it may exert when ingested in homeopathic doses; it also may even have a favorable effect on some tissues when taken in very minute quantities. This review (55 references) discusses F in rocks, soils, and water and in plant nutrition, its occurrence in foods of plant origin, the dispensability of F in animal nutrition, its metabolism in the animal body, the physiological effect of low levels of dietary F, and the toxicity of excessive intakes of F.

Physiological studies on some members of the family Saprolegniaceae.—III, Nitrogen requirements, K. S. BHARGAVA (*Jour. Indian Bot. Soc.*, 24 (1945), No. 2, pp. 67-72).—This installment (E. S. R., 93, p. 557) reports that *Achlya* sp., *Isoachlya anisospora indica*, *Saprolegnia delicata*, and *S. monoica* are unable to utilize nitrite or nitrate as N sources, but thrive on ammonium and organic nitrogenous compounds. Glutamic acid served as the best source and acetamide as the poorest. *Brevilegnia gracilis* obtained N from nitrates as well; addition of Mo failed to aid in assimilating nitrates. Glycin—a good N source for *B. gracilis*—was valueless for the growth of the other fungi studied and remained so even in the presence of an oxidizable substrate.

Survey of growth and gas production of genetic variants of *Saccharomyces cerevisiae* on different sugars, C. C. LINDEGREN, S. SPIEGELMAN, and G. LINDEGREN (*Arch. Biochem.*, 6 (1945), No. 2, pp. 185-198, *illus.* 12).—Among the 1,450 genetically different strains of this yeast grown on five different sugars, a wide variety of physiological types was found within every family; the range was as great in highly selected commercial strains as in laboratory strains. Certain biochemical types were noted. Among them were strains producing more gas and giving a higher yield on maltose than on an equivalent amount of glucose; analogous strains were found for sucrose. Certain strains had a greater fermentative power and yield on glucose than on levulose. Others could not ferment glucose appreciably but grew well on it. Analogous strains were found for all the other sugars tested, viz, galactose, levulose, maltose, and sucrose. The significance of these findings for the comparative biochemical study of the yeasts is discussed.

On the inability of intact yeast cells to ferment their carbohydrate reserves, S. SPIEGELMAN and M. NOZAWA (*Arch. Biochem.*, 6 (1945), No. 2, pp. 303-322, *illus.* 7).—The endogenous respiration of six strains of yeast was examined; two were representative of *Saccharomyces cerevisiae* and the others were *S. carlsbergensis*, *Schizosaccharomyces pombe*, *S. octosporus*, and *Saccharomyces ludwigii*. In all cases dissimilation of the carbohydrate reserves was aerobic. None exhibited any ability to ferment their internally stored carbohydrate, although all actively fermented glucose. The implications of these results for the problem of carbohydrate metabolism and the influence of structural integrity on cell physiology are discussed.

Studies of *Fusaria* pigments and fats and their relation to enzymatic dehydrogenations, R. P. MULL (*Diss., Fordham Univ., New York, 1944*, pp. 18-20).—An abstract of a doctor's dissertation.

Anther color in willows, E. C. SMITH. (Colo. State Col.). (*Amer. Midland Nat.*, 34 (1945), No. 2, pp. 440-444).—The author's attention was first directed to the color of the anthers during several years of field work in connection with a study of Colorado willows; he observed that the anthers of several species were a bright red, the color varying in intensity in different species and at different degrees of development. Although the present study covers too limited a field for any statement as to the constancy of the phenomena reported, it is submitted in the hope of stimulating observation and eliciting reports from other parts of the United States and Canada.

Some factors concerned in the process of starch storage in the barley grain, H. K. ARCHBOLD (*Nature [London]*, 156 (1945), No. 3951, pp. 70-73).—The author concludes from findings reported in the literature (15 references) that starch synthesis probably proceeds simultaneously with the formation of its precursor by photosynthesis, storage of reserves during the vegetative stage of growth playing no essential role. Assimilation for this purpose is not, however, confined to the leaves but is carried on in turn by all the green surfaces of the plant. A short account of the considerable body of evidence now accumulated supporting this view forms the subject of this paper.

Critical periods in the nitrogen nutrition of sugar-beet, T. T. DEMIDENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 47 (1945), No. 1, pp. 61-63).—On the basis of the findings reported the author concludes that sugar beets require N throughout the growth period. The time of intense development of the assimilatory apparatus (formation of 4 to 7 pairs of leaves) should be considered as critical with respect to N nutrition. Irrespective of the developmental stage, the cutting off of the N supply reduced the yields of both root and leaf. When supplied during the second half of the growth period, the effect of N was to increase the colloid content of the cell sap. By excluding N from the nutrient solution at the period of sugar accumulation (formation of 7 to 10 pairs of leaves)

the amount of soluble N was reduced; furthermore, by excluding it, the plant's uptake not only of N, but also of P and K, was reduced. The longer N was withheld the less were the nutrient elements absorbed, for the deficiency of one of the most important constituents prevented the normal development of the organism as a whole.

A review of literature on *Taraxacum kok-saghyz* Rod., G. KROTKOV (*Bot. Rev.*, 11 (1945), No. 8, pp. 417-461).—In this comprehensive review (235 references), the author reports kok-saghyz to be one of the most promising rubber plants found in recent years; it was discovered in 1931 in the central Asiatic regions of U. S. S. R., near the Chinese border. Its anatomy, physiology, and biochemistry, cultivation, pathology, and selection are considered, as well as analytical methods for determining its rubber content and the technology of extraction and products.

Anaerobic fermentation of *Cryptostegia* leaves for recovery of rubber, J. NAGHSKI, J. W. WHITE, JR., S. R. HOOVER, and J. J. WILLAMAN. (U. S. D. A.). (*Jour. Bact.*, 49 (1945), No. 6, pp. 563-574, illus. 2).—A 2-day fermentation of preboiled *C. grandiflora* leaves by *Clostridium roseum* at 35°-45° C. effected a loss of 60 percent in the original dry weight of leaves and a 75 percent loss in crude cellulose. Thus—on a moisture-free basis—the rubber content of the product was over 2.5 times that of the original material. Parenchyma cell protoplasts were liberated by destroying their cell walls. Screening fermented leaves sufficed to separate the protoplasts containing the cell rubber from the latex rubber in the other fraction comprising the veins, epidermis, and cuticle. The protoplasts were resistant to action by acids, but were dissolved by dilute alkali; the liberated rubber globules rose to form a cream. It was established microscopically and chemically that *C. roseum* ferments the cellulose fractions of leaves in situ. There are 19 references.

On photoperiodic effect of jute plants, J. C. SEN GUPTA and N. K. SEN (*Indian Jour. Agr. Sci.*, 14 (1944), No. 3, pp. 196-202, illus. 4).—In these preliminary experiments, potted plants of *Corchorus capsularis* and *C. olitorius* were exposed to a daily light period shortened by 3 hr. at two stages, beginning (1) after germination and (2) when the plants were 30 days old, and in each case lasting for 60 days. Both species responded to treatment by earlier flowering and fruiting than the control, the first treatment proving the more effective. Early induction of the sexual phase greatly modified the course of vegetative development, and response in this respect was more pronounced for the first treatment. Response to short-day treatments resulted in lowering the height, the stem diameter, and the numbers of nodes and leaves and increasing the number of branches, shorter, more bushy plants resulting.

A rapid squash technique for stem and root tips, L. P. V. JOHNSON (*Canad. Jour. Res.*, 23 (1945), No. 4, Sect. C, pp. 127-130).—A method—described in detail—for preparing permanent slides of stem and root tips for chromosome studies is reported to have proved satisfactory in over 20 plant species—mainly in the pine family.

A water method for rapid demonstration of mitotic division in *Allium cepa* root tips, W. EPSTEIN (*Biol. Rev. City Col. [New York City]*, 7 (1945), No. 1, pp. 21-22).

Cytological studies in *Spinacia* and *Allium*, E. R. WITKUS (*Diss., Fordham Univ., New York, 1944*, pp. 15-17).—An abstract of a doctor's dissertation.

Growth processes of *Corallorhiza*, H. S. REED and D. T. MACDOUGAL. (Univ. Calif.). (*Growth*, 9 (1945), No. 3, pp. 235-258, illus. 5).—The authors analyze "the growth and development of the flower-bearing axis of a plant from which it has been possible to formulate some new and fundamental concepts of development" in this study, as exemplified in an orchid.

Asclepias syriaca and *A. speciosa*, distribution and mass collections in North Dakota, O. A. STEVENS. (N. Dak. Expt. Sta.). (*Amer. Midland Nat.*, 34 (1945), No. 2, pp. 368-374, illus. 4).—Measurements of 844 leaves from 37 collections showed the average width to be the same for both these milkweeds, but *A. syriaca* was longer with a width-length ratio of 0.47 as compared with 0.56 for *A. speciosa*. The leaves were also grouped in classes by shape, base, and apex; *A. syriaca* tended to be oblong, while *A. speciosa* was commonly ovate, often with a cordate base. Variation in flower size and shape is discussed, and fruit forms in *A. syriaca* are illustrated. A supposed hybrid between the two species is also illustrated. *A. syriaca* is common in eastern North Dakota, where *A. speciosa* also occurs; both occur through the east-central part of the State, but only *A. speciosa* is found in the western part.

Cicatrization in leaves of *Bryophyllum calycinum*, W. B. WELCH (*Bot. Gaz.*, 107 (1945), No. 1, pp. 95-106, illus. 37).—Stages in the development of the pseudocicatrice and cicatrice were traced from wounds in the leaf at its margin, in the center, and at the petiole. Two series of leaves were used, viz, one attached to the plant and the other removed and allowed to dry in the laboratory. The collapse and the development of the pseudocicatrice proved to be greater in the attached than in the detached leaf. There was no evidence of abscission in either group of leaves. The idea that abscission of tissues develops in response to wounds if the moisture supply to the leaf is high does not appear to apply in this plant. Any loss of tissue must have come from mechanical agitation rather than abscission.

Abnormal lignification in the wood of some apple trees, A. B. BEAUBANE and E. C. THOMPSON (*Nature [London]*, 156 (1945), No. 3953, pp. 145-146, illus. 2).—A condition generally referred to as "rubbery wood" has been observed in many trees of the Lord Lambourne variety; histological studies indicated the flexibility of the stems to be associated with a lack of lignification in many of the xylem fibers and vessels. A similar lack of lignification was also found in rubbery branches of three other apple varieties, two of which were growing near affected trees of the Lord Lambourne variety.

GENETICS

Genetics, E. ALTENBURG (*New York: Henry Holt & Co.*, 1945, pp. 452+, illus. 148).—A presentation of theories of heredity, with emphasis on the origin and evolution of a germ plasm with its physical and chemical constituents and its interrelation with the environment. Emphasis is placed on principles rather than details. Examples are given largely from *Drosophila*.

Tempo and mode in evolution, G. G. SIMPSON (*New York: Columbia Univ. Press*, 1944, pp. 237+, illus. 36).—The chapter headings of this book are rates of evolution; determinants of evolution; micro-evolution, macro-evolution, and mega-evolution; low-rate and high-rate lines; inertia, trend, and momentum; organism and environment; and modes of evolution.

Multi-dimensional graphical representation for analyzing variation in quantitative characters, E. M. KERN and C. ALPER (*Ann. Missouri Bot. Gard.*, 32 (1945), No. 3, pp. 279-281, illus. 2).—In studying the results of a cross between *Nicotiana langsdorfi* and *N. alata*, the authors developed a graphical method for analyzing the variation in four distinct characters considered together; this is described and illustrated.

An attempt at a synthesis of the physiological and cytological concepts of the gene, J. A. SERRA (*Bol. Soc. Broteriana*, 2. ser., 19 (1944), No. 1, pp. 327-369, illus. 4).—The author has "attempted to arrive at a synthesis between the two opposed theories of the hereditary material: The theory of the gene as a unit and the theory of the chromosome as a whole." There are over three pages of references.

Inheritance of resistance to barley stripe, D. C. ARNY. (Wis. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 10, pp. 781-804, illus. 6).—Two types of resistance and two types of susceptibility to *Helminthosporium gramineum* were apparent in the varieties investigated, the differences being evident from the varietal reactions and the effects of the differences on the progeny of crosses. Persicum and Brachytic remained highly resistant to the culture used, and the modes of inheritance indicated that these two varieties had some factors for resistance in common. In crosses with Oderbrucker their resistance appeared to be dominant, and three factors were probably involved. The resistance of Lion was incomplete and was apparently inherited in a different manner from that of Persicum. Dominance was indefinite, and a number of factors were involved. The susceptibility of Oderbrucker probably differed from that of Colsess and Iris, as in the crosses Persicum \times Iris and Colsess \times Brachytic a difference of one major and one modifying factor pair was involved in each case. Marker genes in six of the seven linkage groups present in barley were tested for their relationship to stripe reaction; no associations were found. There are 16 references.

Genetics of sesame.—II, Inheritance of seed pod number, aphid resistance, "yellow leaf," and wrinkled leaves, D. G. LANGHAM (*Jour. Hered.*, 36 (1945), No. 8, pp. 245-253, illus. 8).—Extra pods in leaf axils, yellow color nearing maturity, and wrinkled leaves (a semi-lethal) in sesame (E. S. R., 93, p. 559) all appeared to be conditioned by recessive genes, whereas aphid resistance is more complex in inheritance.

Um estudo citológico dos trigos durum Portugueses [A cytological study of Portuguese durum wheats], A. CÂMARA (*Bol. Soc. Broteriana*, 2. ser., 19 (1944), No. 1, pp. 273-287, illus. 1).

Inheritance in *Nicotiana tabacum*.—XIX, Identification of the tabacum chromosome replaced by one from *N. glutinosa* in mosaic-resistant Holmes Samsoun tobacco, D. U. GERSTEL (Univ. Calif.). (*Genetics*, 30 (1945), No. 5, pp. 448-454, illus. 1).—The author showed previously (E. S. R., 90, p. 607) that mosaic resistance was introduced into Holmes Samsoun tobacco from *N. glutinosa* by substituting a pair of *glutinosa* chromosomes for one of *N. tabacum*. By morphological and cytogenetical analysis, using the monosomic series of *N. tabacum*, he identified the replaced chromosome as the II chromosome. There are 17 references.

Varietal variation and inheritance studies on natural water-soaking in tobacco, H. E. HEGGESTAD (Wis. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 10, pp. 754-770, illus. 3).—The natural water-soaking reactions of several foreign, domestic, and local tobacco varieties were compared under both moist-chamber and outdoor plant-bed conditions. The amount of water-soaking is expressed as a "score" based on the amount of leaf area water-soaked and the percentage of plants thus affected. One of the moist-chamber tests yielded varietal differences in score of 2.36 to 0.09 and in plants water-soaked of 100 to 8 percent, respectively. The inheritance of natural water-soaking in crosses involving seven varieties ranging in reaction from highly resistant to highly susceptible was studied. The F_1 of most crosses appeared intermediate between the parents; when some varieties were crossed, however, there was evidence of partial dominance of resistance. The reactions of F_2 and of F_3 clearly indicated segregation of the genetic factors controlling inheritance of this character. Many such factors appear to be involved. F_2 families approaching the resistance of the most resistant parent were obtained. Tobacco varieties also exhibited varying degrees of resistance to wildfire (*Phytophthora tabaci*) when inoculated under conditions favorable to natural water-soaking; resistance was closely correlated with resistance to water-soaking. Variation in reaction to natural water-soaking was also found among 14 species of *Nicotiana* and among varieties of tomato, oats, and corn. Oats varieties inoculated with *P. coronafaciens* also showed correlation of water-soaking and disease. There

Seed collapse following matings between diploid and tetraploid races of *Lycopersicon pimpinellifolium*, D. C. COOPER and R. A. BRINK. (Univ. Wis.). (*Genetics*, 30 (1945), No. 4, pp. 376-401, illus. 28).—Practically all the seeds formed in the $2n \times 2n$ mating were plump at maturity. About two-thirds of those found in $4n \times 4n$ fruits were sound and the remainder shrivelled. Crosses between the $4n$ tomato and *L. peruvianum* gave a relatively high proportion of plump although small seeds. The seeds in the mature fruits resulting from the $4n \times 2n$ and $2n \times L. peruvianum$ matings on the other hand were much shrunken and incapable of germination.

Double fertilization takes place and both endosperm and embryo start growth in all developing seeds. Fertilization occurred approximately 24 hr. following pollination of $2n$ flowers, but was somewhat delayed in $4n$ flowers regardless of the type of mating. Growth of the endosperm in the $2n \times 4n$, $2n \times L. peruvianum$ and $4n \times 2n$ was slow, and the cells at the chalazal end were large and highly vacuolate in 144 hr. The endothelium becomes actively meristematic and grows rapidly, so that this tissue has within a few days filled completely the space occupied formerly by the endosperm. The embryo grows slowly and is very small and starved in appearance by the time it has become surrounded by the hyperplastic endothelium. Shortly afterward the embryo dies and a much shrivelled seed may be observed in the mature fruit.

The course of seed failure associated with matings between a diploid and its autotetraploid is very similar to that found following the interspecific cross.

A survey of cytogenetic causes of unfruitfulness in the tomato, C. M. RICK. (Univ. Calif.). (*Genetics*, 30 (1945), No. 4, pp. 347-362, illus. 18).—A total of 66 unfruitful tomato plants found in commercial plantings in the lower Sacramento Valley were propagated by cuttings and grown a second season for intensive study. Of the 66, 45 proved to be triploid, 14 diploid, 3 tetraploid, 2 trisomic, and 2 haploid. The tetraploids were the most fruitful of the heteroploids, reflecting a greater chromosome balance in gamete formation than in the other types.

In the 14 diploids, 3 were aberrant in gross morphology. Three plants exhibited male sterility, determined in each case by a single recessive gene. Five plants were normal in every respect except for complete pollen and ovule sterility. Three plants were lost. Gene mutation in the broad sense is believed responsible for sterility in the 11 diploids under study. A gametic mutation rate of approximately 0.02 percent was estimated, with the three varieties under observation (Early Santa Clara, Pearson, and San Marzano) being very similar in the frequency of all unfruitful types and in the proportions of each type.

Coat color inheritance in horses, J. M. DURRANT (*Canad. Cattleman*, 8 (1945), No. 2, pp. 62-63, 102, illus. 1).—A review and tabulation is given of coat color inheritance in horses based largely on the study of Gremmel (E. S. R., 82, p. 465).

Predictability of breeding efficiency in dairy cattle from their previous conception rate and from their heredity, G. W. TRIMBERGER and H. P. DAVIS. (Nebr. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 9, pp. 659-669).—It was not possible to predict the breeding efficiency of daughters from the breeding records of their dams based on the average number of services in all conceptions throughout the lifetime of the dams. When the services per conception were tabulated by cow families there was 1 in 20 with very low fertility and 2 with extreme high fertility. The daughters of 19 bulls showed 1 with daughters that required a highly significant number of services per conception and another which closely approached this level. The study is based on conceptions of 221 virgin heifers and 418 cows of the Ayrshire, Guernsey, Jersey, and Holstein breeds, artificially bred for first, second, third, fourth, and fifth or more services during an 8-yr. period in the University of Nebraska herd. An average number of 2.24 services was required per conception in August with a lesser number during the rest of the year.

Sterility in bulls, C. W. TURNER. (Univ. Mo.). (*Guernsey Breeders' Jour.*, 68 (1945), No. 8, pp. 793-794, 818, 819).—Data are given on the relationship of hormones to reproduction of bulls much as was given for the relation of hormones to reproduction in the cow (E. S. R., 93, p. 141).

Stimulation of livability and glycolysis by additions of glucose to the egg yolk-citrate diluent for ejaculated bovine semen, G. W. SALISBURY and N. L. VANDEMARK. (Cornell Univ.). (*Amer. Jour. Physiol.*, 143 (1945), No. 5, pp. 692-697).—"In an investigation to determine the effect of adding from 58 to 116 mg. of glucose per 100 cc. to bovine semen diluted at the rate of 1 part of semen to 4 parts of the yolk-citrate diluent and incubated for 1 hr. at 46.5° C. or stored for 10 days at 5°, it was found that: (1) The added glucose promoted increased livability and lactic acid production during incubation for 1 hr. at 46.5° and during storage for 10 days at 5°. (2) The stimulation of motility duration and lactic acid production occurred in spite of the fact that the initial glucose stores of the diluted semen samples were not depleted. (3) The glucose loss during low-temperature storage in the three separate experiments proceeded at similar rates regardless of the quality of semen used. (4) Glucose loss was not directly related to the livability of the spermatozoa unless that sugar was glycolyzed to lactic acid. (5) The proportion of glucose loss recovered as lactic acid was dependent upon storage interval and upon the quality of the semen used in the separate experiments and varied from less than 25 percent to complete recovery."

Colour inheritance in crossbred pigs of Large White-Tamworth origin, F. W. DRY and M. M. COOPER (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 1, Sect. A, pp. 64-71).—Combination of the characters for Large White and red Tamworth breeds of swine extended over a period of 5 yr. White was shown to be simple dominant to colored, but many white crossbreds have red fibers of varying abundance and a few black fibers. Most white crossbreds with red fibers were heterozygous, but two with a few red fibers proved to be homozygous whites and some heterozygotes were free from colored fibers. Modifying factors of the shade of red or black were evidently operative. In general, with typical reds there was a smaller area of black blotches. Black and white pigs were regarded as extremely pale reds. Black was hypostatic to white in Large White and red in the Tamworth. Modifying factors permitting the expression of black in red pigs were introduced from Large Whites. These probably act indirectly by making red lighter so that black can penetrate more easily and directly, in that some deep-red pigs of crossbred origin have black spotting. The difference between the two extremes, dark red and black and white, depends on a small number of genes, but further analysis of the results seems needed.

A new recessive lethal mutation in mice, K. B. DEOME (*Calif. Univ. Pubs. Zool.*, 53 (1945), No. 2, pp. 41-65+, illus. 13).—A new mutation in the house mouse, called "jittery," is described. Affected animals are normal at birth, but at 10 to 16 days symptoms of muscular incoordination appear, followed by tetany, loss of weight, extreme emaciation, and finally death at about 31 days. Genetically, the condition was due to an autosomal recessive gene. In parabiotic union with normals, jittery mice showed no tetany, attained a larger size, and lived longer than controls. Similar results were not obtained by forced feeding, pituitary implants, thymus implants, feeding carotene, or injecting calcium salts. The calcium content of the jittery mice was normal. Histologically, the pituitary showed an increased number of cells with a correspondingly smaller mass of cytoplasm, hyperchromatic nuclei, and engorged blood passages. Eosinophile cells were present, but the proportions were not determined. A hypoactive thyroid gland was found, and the thymus, which is normally persistent in mice, underwent involution following starvation. Characteristic changes in the pituitary and degeneration of the motor cells were not apparent. The immediate cause of jittery was not attributed to any

of the pathological conditions. An extensive list of references to the literature is cited.

Breeding for egg shell quality as indicated by egg weight loss, J. P. QUINN, C. D. GORDON, and A. B. GODFREY. (U. S. D. A.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 399-403, illus. 3).—In a study of the effect of breeding and selection on improving eggshell quality in one line of White Leghorns and in decreasing shell quality in another, egg weight loss during 14 days' incubation at 99.5° F. and 60 percent relative humidity proved to be a satisfactory method for indicating shell quality and gave measurable and satisfactory results from 1937 to 1943, indicating that this characteristic was inherited. The mean egg weight loss of the 1943 progeny was 5.9 percent as contrasted with about 7.2 percent for breeders in 1936. In the high-loss line the increase from the same base was a total in 1943 of 10.5 percent. A total of 200 breeders and 691 ♀ progeny with 10 eggs of each were used in the investigation.

The influence of inbreeding on sexual maturity, N. F. WATERS. (U. S. D. A.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 391-395, illus. 1).—In 15 different inbred lines of Single-Comb White Leghorn hens at the U. S. Regional Poultry Research Laboratory (E. S. R., 93, p. 565), there was little change in the mean age at sexual maturity between five generations obtained in the years 1939-43 in 11 of the lines, but 4 showed increases during the two most recent generations. The observations of age at production of the first egg were made on 2,821 hens.

Isolating gene E' for early sexual maturity, F. A. HAYS. (Mass. Expt. Sta.). (*Amer. Nat.*, 79 (1945), No. 783, pp. 372-377).—The autosomal gene E' for early maturity was combined with sex-linked characters for barring and silver in the hybrids between Barred Plymouth Rocks and Rhode Island Reds. A straight homozygous strain for the autosomal gene E' alone was then developed. Finally, a pure line for E' was crossed with a line carrying both genes E and E'. Daughters carrying E' alone usually ranged in sexual maturity from 190 to 200 days. The mean age of sexual maturity was reduced to 170-175 days when both genes E and E' were brought together, but the mean age of groups with both E and E' absent ranged from 250 to 300 days. Daughters up to the sixth generation were produced in arriving at the conclusions.

Lymphomatosis in chickens as influenced by diallel crossing, N. F. WATERS. (U. S. D. A.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 387-390).—In continuing studies of inheritance of resistance and susceptibility to avian lymphomatosis (E. S. R., 93, p. 565), the influence of the sire was investigated by means of diallel crosses of 12 sires and 18 dams (36 degrees of freedom) of the Single-Comb White Leghorn breed. Six sets of dams with 2-4 dams in each set were mated with 2 sires, producing 387 progeny. The progeny from 1 sire differed significantly from those of another when both sires were mated to the same dams. These results suggest that the differences are largely due to sire influences.

Goiterogenic diets and their effects on thyroid hyperplasia and vital organs of the chick, L. W. NICHOLSON and W. R. BRENNEMAN (*Poultry Sci.*, 24 (1945), No. 5, pp. 426-433, illus. 2).—Thyroid hyperplasia was produced in chicks by feeding rations low in iodine content. The goiterogenic effect was not counteracted by the use of distillers' dried solubles as a vitamin supplement at levels ranging from 3 to 8 percent. Observations on growth and development of the vital organs showed that thyroid hyperplasia on rations low in iodine and containing 5 percent meat and bone scrap stimulates sexual development (using comb and gonad weights as criteria). However, thyroid enlargements on vegetable rations do not cause stimulation of sexual development. In all but two of the eight lots on vegetable rations, the low iodine groups showed greater comb and gonad weights than those receiving KI. With increases in thyroid weights, adrenal weights tended to decrease, but there was no marked effect on the pancreas and liver. Intestine

lengths of lots receiving 3, 4, or 5 percent distillers' dried solubles, with or without alfalfa leaf meal, and rations containing corn gluten meal or cottonseed meal showed signs of splanchnomegaly. Intestines showing increased length were usually lighter in weight, smaller in diameter, and thinner walled. Omitting KI from the rations increased the thyroid weights two to three times. With thyroid enlargements the greatest mean body, comb, and gonad weights were produced. Hyperplastic goiters in chicks resulting from low iodine rations were not necessarily detrimental to the growth or sexual development in chicks up to 11 weeks. Records were on average body weights at 2-week intervals and the glands and intestines weighed and arbitrary measures designated at 5 or 6 weeks after hatching. The extensive bibliography brings out relations of endocrines to goiter in the chick.

FIELD CROPS

Numbering and note-taking systems for use in the improvement of forage crops, L. C. NEWELL and H. M. TYSDAL. (U. S. D. A. coop. Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 9, pp. 736-749).—The system of numbering plant and seed material presented for use in the improvement of cross-pollinated forage grasses and legumes is broadly applicable and flexible as a basic system for use in the breeding of any crop. The essentials include the designation of the year of seed production or plant selection and a treatment index number giving the breeding procedure or the conditions under which seed is produced. These designations are prefixed to the serial number of a selection. The year of selection appears first in the identification, and for brevity is the last figure of the applicable calendar year, and is followed by a number or letter as a treatment index separated from the serial number by a dash. Selections are serially numbered over a period of years with descriptions of the plant material recorded in accession books. A set of treatment index numbers with descriptions of breeding procedures to which they refer and examples of their use are presented to show their application in a plant improvement program. The proposed system of numbering is advantageous to a breeding program in the ready recognition of plant and seed materials with a minimum of numbers and in keeping track of changes in genetic composition during the process of improvement. In a plan also described for the numerical recording of comparative notes on plant materials, the lowest figure in a scale of 1 to 9 represents the most desirable expression of the character. The application and advantages of such a system are discussed.

The response of various forage grass and legume seedlings to phosphate fertilization under greenhouse conditions, R. R. ROBINSON. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 147-150, *illus.* 1).—The seedling responses of timothy, orchard grass, bromegrass, tall oatgrass, alfalfa, Ladino clover, red clover, and birdsfoot trefoil to six levels of phosphate fertilization were determined in the greenhouse on Hagerstown soil. Each of the grasses made greater increases in yields of dry matter and greater percentage increases from high rates of P fertilization than did any legume. At the lower P levels alfalfa and red clover yielded more dry matter than timothy, orchard grass, and bromegrass, but at the higher levels the grasses produced more. Results from Ladino clover and timothy at different levels of Ca, K, N, and manure indicate that differences in P response could not be attributed to a deficiency of nutrients other than P.

Native forage plants, H. H. BISWELL, R. W. COLLINS, J. E. FOSTER, and T. S. BOGGESE, JR. (Coop. U. S. D. A. et al.). (*North Carolina Sta. Bul.* 353 (1945), pp. 27, *illus.* 17).—The main range plants grazed by beef cattle in the forest range of the Coastal Plain in different seasons of the year and their relative palatability and nutritional value are discussed from observations 1941-43, with comments on grazing capacity, effects of burning, and nutrient deficiencies.

It is concluded that range management practices in the region should be built largely around the reed (*Arundinaria tecta*), since it furnishes most of the forage on native range. Warty panicum, bluestems, cutover muhly, toothache grass, giant bristlegrass, and beakruses also are grazed to some extent. Browse plants where available furnish considerable feed in winter, although on the areas under observation grasses and grasslike plants still comprised the bulk of the forage. Broad-leaved herbs are of minor importance in the reed type, furnishing only 7 percent of the forage. Netvein chainfern and cinnamon fern start growth in very early spring and furnish grazing before new growth of most other plants is available. Grazing use of different forage species on any area is closely related to their relative abundance. Hardwood trees are browsed more than pines.

Reeds are killed easily by heavy grazing through several successive growing seasons and quickest where heavy grazing closely follows burning. They should be grazed either moderately throughout the season, or if heavily for only short periods. Burning reed areas delays the grazing season 1 to 4 weeks, causes the reeds to be damaged more easily by heavy grazing, makes the foliage less frost-resistant in the fall and the leaves drop earlier, and reduces the forage available for grazing.

Grazing capacity of native range has varied from 3 to 4 acres per animal from May 15 to November 15 where reeds are vigorous, from 10 to 12 acres in moderately good areas, and 10 to 12 acres for only 4 mo. on poor reed areas.

Summer forage has been adequate in protein, although supplements are needed in winter. A mineral mixture may offset P and possibly Ca deficiencies. Gains have been related to forage quality and abundance.

New Russian grasses show great promise for seeding Colorado ranges and pastures, C. H. WASSER and E. W. NELSON (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 4, pp. 2, 10-12, illus. 2).—Intermediate wheatgrass, under test since 1935, is a tall, cool-season grass which spreads from moderately vigorous underground rootstocks to produce a sod. Russian wild-rye, tested since 1939, is a cool-season bunchgrass with many long basal leaves and a fair amount of leafless seed-stalks. Both grasses have shown promise in trials to reseed small areas of abandoned croplands under dry-land conditions, and may be planted at about the same time that crested wheatgrass and brome are best sown—early fall, late fall for spring germination, or early spring. Grazing of seeded stands should not begin until the second season and even then should be light until the third season, particularly with Russian wild-rye. Moderate grazing is advised to perpetuate a good high-producing stand, for these grasses will not withstand as close grazing as short grasses. Adaptations, feeding values, and seeding practices are indicated.

Some experiences in revegetating poor hill land pastures in West Virginia for improved conservation and production, R. M. SMITH, G. G. POHLMAN, F. W. SCHALLER, and D. R. BROWNING. (W. Va. Expt. Sta. and U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 200-207).—Comparisons were made of surface applications of lime and fertilizer with tillage and reseeding in addition to basic lime and fertilizer treatments for improvement of very poor hilly pasture. When plowing was compared with shallow tillage, using a disk, spring-tooth harrow, or field cultivator for seedbed preparation, plowed areas usually had more grasses and a larger percentage of desirable species but also had more bare space and was more subject to erosion than surface-tilled areas. Surface tillage usually resulted in more legumes, higher yields, and less bare space than either surface-treated or plowed areas. Satisfactory surface tillage was accomplished by all implements used, best results being obtained where surface vegetation was rather sparse and the ground moist or even wet. Tillage was most easily accomplished in late winter or early spring, yet satisfactory results were also obtained in the summer. Although controlled grazing is desirable, good results were obtained even when the new

seedings were heavily grazed. Manuring helped to prevent overgrazing and was always beneficial. White clover, alsike clover, sweetclover, orchard grass, ryegrass, and Kentucky bluegrass appeared to be the most promising of the plants included in the mixtures. The tillage and reseeding methods used appeared most promising when the contents of desirable species are very low and surface treatment is only slowly effective in their spread. See also an earlier note by Pohlman and Cornell, jr. (E. S. R., 90, p. 329).

Seminal root number in cultivated barley, M. N. POPE. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 9, pp. 771-778).—In well-matured seeds of cultivated barley the average number of seminal roots of 72 pure-line varieties ranged from 5.4 in Winter Club to 8.9 in Alpha and White Smyrna. Within a variety the number was relatively uniform, seldom varying by more than 2 roots. It appeared that seminal root number is a varietal character. Within a species, varieties of *Hordeum distichon*, with the widest diversity of forms and sources of origin, ranged from 5.6 to 8.9 seminal roots; *H. deficiens* and *H. irregulare*, varietal ranges of variation of 1.5 roots; and *H. intermedium* and *H. vulgare* each one of 2.1 roots. Doubling of chromosome number did not affect formation of seminal roots. No association was apparent between seminal root number and density of spike, color or seed, adherence of lemma and palea, or character of lemma tip. Area of absorptive surface of the scutellum of 8 different varieties was not correlated with seminal root number, which in mature seed appeared independent of length of developmental period and of seed weight. Within a variety seminal root number increases with number of days after pollination. In Manchuria barley the earliest viable immature stage showed 3 roots in sections and produced on germination a maximum of 3. In field samples of Wisconsin Barless barley, a correlation coefficient of 0.776 was found between kernel weight, as indicating stage of development at harvest, and number of seminal roots. No correlation was found between number of seminal roots and malting quality as measured by diastatic power or by percentage of wort N produced in 12 varieties grown in 3 yr. at 3 places, or in samples of Wisconsin Barless.

Investigations with the castor bean plant.—I, Adaptation and variety tests, W. E. DOMINGO and D. M. CROOKS. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 9, pp. 750-762).—Adaptation and variety tests 1941-43 (E. S. R., 92, p. 200) revealed that the general area of adaptation for the present castor-bean varieties is largely determined by a disease, length of growing season, and rainfall. Most of the Gulf Coastal region is not suitable for commercial production because of the chance of severe loss from gray mold (*Sclerotinia ricini*). Production becomes hazardous in areas with a growing season shorter than 180 days, and between 15 and 20 in. of rainfall from April to September is essential to satisfactory yields. The area of best adaptation thus includes, roughly, the southeastern half of Kansas, Missouri, the southern third of Illinois, southern Indiana, the southern tip of Ohio, the western and central parts of Kentucky and Tennessee, Arkansas, all of Oklahoma except the Panhandle, the part of Texas north of Dallas and east of Lubbock, and the area within a radius of about 50 miles of Corpus Christi. Within this general area are soils of different suitability for castor-beans. A soil satisfactory for this crop should have exceptionally good surface and under drainage, sufficient subsoil permeability to insure the adequate movement of air and water and the growth of roots, and capacity to warm up readily in the spring. Some of the larger general sections in which at least half of the land is of the desirable soil types are listed. Of the varieties studied most critically, Conner was oftenest the highest yielder, but had a lower hulling percentage than Doughty 11 and Kentucky 38 under certain conditions. Kentucky 38, a shorter and earlier variety, has smaller racemes and shows a tendency to lodge and shatter under certain conditions.

A preliminary survey of maize in the southwestern United States, G. F. CARTER and E. ANDERSON (*Ann. Missouri Bot. Gard.*, 32 (1945), No. 3, pp. 297-322, illus. 24).—A preliminary report is made on a classification of the corn of the southwestern United States, particularly varieties grown by the Indians. Such corn has come from at least four different sources, i. e., the Basketmakers, the Hohokam, the Mexican plateau, and eastern North America. In the Southwest, ear taper, row number, and denting of the kernel, referred to as the Mexican complex of characters, are correlated. Kernel width, shank diameter, an enlarged butt to the ear, and straight rows, called the "Eastern" complex, are also correlated. These and two other characters were used in constructing two indices for measuring southwestern corn. Plotted on x and y axes they form a "comparison grid" on which scatter diagrams of the corn from one pueblo may be compared with the corn from another, or on which the average values of different collections may be similarly compared. Scatter diagrams are presented for collections of modern corn. Attempts were made to interpret these findings in terms of the history of the Southwest from the beginnings of agriculture to the present.

The origin and nature of the ear of maize, P. C. MANGELSDORF (*Harvard Univ., Bot. Mus. Leaflets*, 12 (1945), No. 2, pp. 33-75, illus. 8).—New facts on the problem of the corn ear (E. S. R., 82, p. 177) are considered. "All of these facts indicate, though they obviously do not prove, that a pure maize originating in South America and bearing ears characterized by whorled phyllotaxy and random arrangement of sessile and pedicellate spikelets has become modified by the introduction of *Tripsacum* (teosinte) germ plasma to produce an ear characterized by spiral phyllotaxy and systematic arrangement of spikelets."

Simulated hail injury of corn, T. A. KIESSELBACH and W. E. LYNES (*Nebraska Sta. Bul.* 377 (1945), pp. 22, illus. 19).—Hail injury to growing corn plants, consisting of various degrees of defoliation or other leaf damage and bruising or breaking of stalks and ears, were simulated by artificial treatments and their effects on plant performance noted. Corn plants cut off 1 in. above the ground level when 8 and 16 in. tall yielded 67 and 32, respectively, as much grain as untreated plants as an average for 9 yr. At 8 in. the tip of the young stem was still underground and therefore uninjured, while at 16 in. the stem had emerged and was cut off, restricting further growth to tillers. Complete defoliation was most serious in the initial tassel stage, resulting in less than 1 percent of a normal grain yield. The younger the plants were prior to this stage the smaller was the harmful effect, due to recovery by further leaf development from higher stem nodes not yet emerged. At more advanced stages effects of leaf loss were also lessened because of grain development that had already taken place and that continued somewhat through further translocation from the stalk even though photosynthetic activity was largely terminated. The greatest loss in yield of grain due to removal of the outer half of each leaf resulted when the plants were in the initial tassel stage. The yield was 70 percent of normal compared with a 1.0 percent yield for plants completely defoliated. Rather similar yield reduction might be expected whether the partial defoliation occurs at the ends or sides of leaves. In the full tassel stage, loss of all, half, and one-fourth of each leaf resulted in yields of 6, 77, and 92 percent of normal, respectively. Corn with approximately half its leaf area removed from the lower portion of the stalks averaged 80 percent of normal yield compared with 41 percent for its removal from the upper half.

Minor leaf injuries such as breaking of midribs and tearing of blades, either crosswise or lengthwise, applied singly to all the leaves at the full tassel stage, have reduced grain yields a maximum of 20 percent below normal. Flailing the plants with equipment that shredded all the leaves and bruised the stalks and ears rather closely approximated hail damage. Grain yields ranged from 46 to 95 percent of normal, with the greatest reduction occurring as a result of injury between

initial and full tasseling. Results obtained from certain plant injuries in comparable experiments reported from Illinois (E. S. R., 59, p. 132; 62, p. 519) and Iowa (E. S. R., 73, p. 775) had a fairly high degree of similarity to these results.

In general, any injury to the corn plant that interferes with its normal physiological activities or that increases infection with harmful diseases, may be expected to curtail its yield and often its quality of grain. The loss in production will vary with the season and the character and extent of injury.

Effect of salt index, analysis, rate, and placement of fertilizer on cotton, J. J. SKINNER, W. L. NELSON, and C. W. WHITTAKER. (U. S. D. A. coop. N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 9, pp. 677-688, illus. 1).—Effects of salt index, analysis, rate of application, and placement of fertilizer on soluble salts in the soil of the cotton root zone and in the plant, on plant emergence, and on final yields were determined in a series of field tests at Rocky Mount, N. C., 1941-44. The fertilizers used were a 6-8-4 (6-8-8 in 1943 and 1944) low and high salt index applied at 400 and 700 lb. per acre, and a 9-12-6 (9-12-12 in 1943 and 1944), low and high salt index, applied at the equivalent rates of 267 and 467 lb. per acre. In 1941-42 the fertilizer was placed in the furrow at planting with the seed located 2.5-3 in. above the fertilizer band; in 1943-44 the fertilizer was also placed in bands 3 in. to the side.

High salt index fertilizers regardless of analysis gave a higher amount of soluble salts in the root zone soil than did the low salt index fertilizers, although side-band placement, as compared with under-seed placement, markedly decreased the soluble salts in the root zone. A high rate of fertilizer application increased soluble salts to some extent. The high salt index fertilizers, the low analysis fertilizers, the 700-lb. rate, and the under-seed placement all tended to increase the soluble salt content in the plant. Correlation between soluble salts in the plant and in the root zone soil was only fair.

Plant emergence was retarded and imperfect stands resulted from the use of high index fertilizers. Fertilizers of the same salt index had about the same effect on emergence and stand when used to supply equal amounts of N, P, and K. Side-band placement improved stands more than low index fertilizers.

The high salt index fertilizer reduced the yield only in 1941, when high analysis fertilizers increased the yield. Side-band placement of the fertilizer as compared to under-seed placement markedly increased yields. The 700-lb. rate of fertilizer tended to reduce yields with under-seed placement, but in 1944, under favorable conditions, the 700-lb. rate with side-band placement gave higher yields than the 400-lb. rate. Potential fertilizer salt injury to cotton may be avoided by using high analysis fertilizers with a low salt index and by placing the fertilizer in side bands. Yields will be lower if the fertilizer injury is severe enough to result in retarded plant development and in imperfect stands after chopping. Under a given set of environmental conditions the yield is the integrated product of the fertilizer effects.

Excessive field exposure coupled with dryness of lint may be responsible for difficulties with "irrigated" cotton, R. S. HAWKINS (*Arizona Sta. Mimeog. Rpt.* 79 (1945), pp. [9+], illus. 4).—Data obtained during recent years indicated that variations in irrigation within rather wide limits do not cause as great differences in such factors as cotton fiber length and strength as do seasonal differences, probably climatic. Arizona cotton is left in the field for longer periods after opening than anywhere else in the United States. Shortage of labor has been the cause of this unsatisfactory situation; machine harvesting may be the answer to this problem. Excessive field exposure evidently is accompanied by excessive drying of the fibers, and this lint is still too dry for good spinning when it gets to the mill. "Timely harvesting would go a long way toward remedying this situation, and installation of moisture adding devices in the gins of the arid Southwest might further correct this difficulty."

Effect of commercial fertilizers on the sex expression of hemp, C. A. BLACK. (Iowa Expt. Sta.). (*Bot. Gas.*, 107 (1945), No. 1, pp. 114-120).—P fertilizers produced a statistically significant increase in percentage of male plants in one of eight field experiments and a decrease in another. K produced a significant increase in percentage of male plants in one experiment. No significant effects were produced by N. All differences due to fertilizers were small, sex ratios varying but little between treatments.

The response of hemp to fertilizers in Iowa, C. A. BLACK and A. J. VESSEL. (Iowa Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 179-184, illus. 1).—Hemp in fertilizer experiments 1943-44 received N, P, and K singly and in combinations in a factorial design. Acre rates employed in the complete mixtures were equivalent to 500 lb. of 5-10-5 in 1943 and to 500 lb. of 10-6-4 and of 20-6-4 in 1944. Yield data showed that N gave the largest increases in yield, followed by P and K in order. Average acre yield increases of green hemp in 1943 were 1.83 tons from N, 1.16 from P, and 0.04 ton from K. In 1944, the average yield increases were 1.74 tons from N 50 lb., 2.47 tons from N 100 lb., 0.20 ton from P, and 0.15 ton from K. Application of N 25 lb. per acre in 1943 usually was insufficient for maximum yields. The 100 lb. of N in 1944 appeared to be ample except where much of the N apparently was lost by leaching before hemp was planted. Response to P was most noticeable early in the season and gradually decreased as the season progressed. Response to N gradually increased throughout the season, provided the N supply was not depleted.

The nature of the flora on field-retting hemp, W. H. FULLER and A. G. NORMAN. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 101-105, illus. 1).—On the many genera of fungi found growing on hemp in Iowa, *Alternaria*, *Hormodendrum*, *Fusarium*, *Phoma*, and *Cephalosporium* predominated. *Alternaria* and *Hormodendrum* spp. were always present on retting hemp and appeared most abundantly throughout the retting process. *Fusarium* spp. were found growing oftenest in the bottom of the swath where wetting and drying were less pronounced and away from the direct sunlight, whereas *Phoma* and *Cephalosporium* were observed oftenest on top hemp. Unlike *Fusarium*, which developed most abundantly during early stages of retting, *Phoma* spp. were found oftenest during the latter stages. *Trichothecium roseum* was found associated with deteriorated fiber during wet periods in 1944. Bacteria appeared on field retting hemp in substantial numbers, particularly during periods when moisture was abundant. Fungi probably are the biological agents most concerned in the retting of hemp in Iowa fields, yet bacteria may also play a significant part when rain is plentiful.

The effect of fertilizer on stand and yield of kudzu on depleted soils, E. C. RICHARDSON. (U. S. D. A. coop. Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 9, pp. 763-770, illus. 2).—Kudzu responded more to phosphate than to other fertilizers applied in the Piedmont and Limestone Valleys and lower Coastal Plain of Alabama. Basic slag, 16 percent superphosphate, and triple superphosphate were of equal value when applied at rates to furnish equivalent amounts of P_2O_5 . The double phosphate application, 128 lb. P_2O_5 , increased the yield significantly over the single application (64 lb.). There was some increase in yield as a result of applying lime (Ca) and K. Applied singly neither Ca nor K produced a significant increase in yield, but in combination they made an increase and with the single application of P resulted in still higher yields. Ca and P applied to kudzu increased the Ca and P content of the hay. Hay from kudzu fertilized with 1,600 lb. of slag per acre had a higher P content than that from receiving 800 lb. Percentages of Ca and P were higher in samples collected in 1941 than in those collected in 1938.

The effect of calcium on certain characteristics of peanut fruit, W. E. COLWELL and N. C. BRADY. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945).

No. 9, pp. 696-708, illus. 5).—Hand-picked peanuts from field experiments in which Ca, K, and Mg variables had been established were classified on the basis of fruit cavity size and kernel development. On soils low in Ca, use of gypsum increased the proportion of a 2-cavity size fruit of Virginia Bunch and N. C. Runner but not of Spanish 2B and White Spanish. Calcium sulfate may have exerted this favorable effect by preventing ovule abortion at a very early stage of fruit development before shell enlargement began. On soils of higher Ca level, where increases in yield and kernel development of Virginia Bunch and N. C. Runner had resulted from Ca additions, gypsum did not increase the proportion of 2-cavity fruits. The Ca level to prevent abortion in the later stages is relatively high in comparison to that to prevent abortion in the early stages. For all 4 varieties there was a higher proportion of the 2-cavity size fruits filled than of the 1-cavity size. For Virginia Bunch and White Spanish this ratio was unaffected by Ca supply, while in N. C. Runner and White Spanish added Ca exerted a relatively greater effect on the fill of the fruit of 2-cavity size. Gypsum increased the average weight of kernels. With all treatments combined, average weights of kernels from 2-cavity fruits wherein both ovules developed were smaller than corresponding weights of kernels from fruits in which only one ovule developed, a difference explained on the basis of ovule competition. The weights of kernels from 1-cavity fruits were, in general, intermediate between the two values referred to above.

Soil management for potato production, J. TYSON. (Mich. Expt. Sta.). (*Imcr. Potato Jour.*, 22 (1945), No. 9, pp. 267-275).—In experiments at Chatham in the Upper Peninsula, potato yields were greater following timothy fertilized with 10-6-4, especially with the large applications, than after alfalfa, red clover, and alsike clover fertilized with 0-14-6. Applications of 400 lb. of 10-6-4 per acre were for timothy hay production, nearly as effective as 800 lb. and superior to 1,200 lb. More growth was produced with the larger applications, but the hay lodged badly and was difficult to harvest. Ammonium sulfate equaled 10-6-4 fertilizer for hay production, but potato yields following the hay were lower. At East Lansing potato production was maintained at a higher level with manure spread on second growth red clover and a 2,550-lb. crop of hay was also harvested than where clover and a subsequent rye crop were plowed under for green manure. Potato yields were not maintained at a high level by clover seedings in grain plowed down next spring. Corn yields were somewhat higher in 1943 and 1944 in the 4-yr. potato-livestock farming type of rotation.

The influence of fertilizers on the specific gravity of potatoes grown in Minnesota, L. E. DUNN and R. E. NYLUND. (Minn. Expt. Sta.) (*Amer. Potato Jour.*, 22 (1945), No. 9, pp. 275-288).—Measurements on potatoes from 37 fertilizer experiments in the Red River Valley and on sandy soils near St. Paul in 1943 and 1944 revealed the greatest differences in specific gravity between locations. N fertilizer had no apparent influence on specific gravity while P caused a small but significant increase, particularly at the higher rates of application. K fertilizers containing chlorides caused a marked reduction in specific gravity, and the depression was greater with the heavier application. K_2SO_4 did not reduce the specific gravity of potatoes, indicating that the Cl anion is responsible for increasing the water content of potatoes. Fertilization did not appear to influence the occurrence of hollow heart. Correlation, $r=0.8686$, between specific gravity and dry matter was found for 260 samples from the Red River Valley.

Nitrogen and phosphate fertilizer levels in relation to potato yields and to soil constituents during dry seasons, R. L. CAROLUS and W. G. WOLTZ. (Va. Truck Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 194-199).—In an experiment during 1941-44 (four dry years) effects of fertilizer treatments involving N, P_2O_5 , K_2O , and CaO in various combinations were observed on potato yields and on some chemical constituents of the soil and plants. N applied in excess of

60 lb. per acre resulted in reduced yields. P_2O_5 160 lb. per acre gave highly significant increases in yield over 80 lb. each year, and 240 lb. over 160 lb. in the third and fourth years. The yield variance due to the $N \times P_2O_5$ interaction was negligible. The soluble N content of the plant was adequate with N 60 lb., but its soluble P_2O_5 content was not in excessive amounts even with the P_2O_5 240 lb. Plots receiving N 180 lb. had become quite acid and had increased in Al and soluble salt content. Increasing the P_2O_5 level in fertilizer decreased the Al in the soil but had little effect on the P_2O_5 level. The low yields produced on plots treated with large amounts of N may be due to the resulting high level of soluble N in the plant, interfering with the efficiency of some metabolic process of the plant.

The effect of chlorine in soils and fertilizers on its distribution in the potato tuber, J. M. MACGREGOR and C. O. ROST. (Minn. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 79-85).—The amount of Cl present in unfertilized potatoes in experiments in the Red River Valley was generally lower than that reported from other regions. Tubers grown in soils fertilized with KCl 200 lb. per acre showed higher Cl concentrations, but the increase was not proportional to the additional quantities of Cl present. Higher Cl concentrations were shown in the exterior parts of the tubers, this distribution being apparently independent of soluble Cl concentration in both the tuber and the soil. Longitudinal Cl distribution was affected by soluble Cl concentrations in the soil. Soils low in Cl produced tubers with more or less even Cl distribution from end to end. Tubers grown in soils receiving KCl exhibited higher Cl concentrations in the stem ends, even after 3 mo. of storage, attributed to a "packing effect" on the part of the potato plant and showing that little or no Cl diffusion apparently occurs in stored tubers. The amount of water-soluble Cl found in Minnesota soils was appreciably lower than concentrations reported present in soils of some other regions. See other notes by Rost et al. (E. S. R., 93, p. 574).

The effect of zinc sulfate added to copper-lime spray on the yield of potatoes on Indiana muck soil, N. K. ELLIS. (Ind. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 131-132).— $ZnSO_4$ used in the potato spray to supplement $CuSO_4$ increased the yield of potatoes. Since disease was not present in any plot and the potato foliage color was changed to a blue green from the normal green expected, it was suggested that the Zn satisfied a minor element deficiency even though no increases in yield are obtained when $ZnSO_4$ is applied to the soil.

Potato varieties: The newly named, the commercial, and some that are useful in breeding, D. FOLSOM. (Maine Expt. Sta.). (*Amer. Potato Jour.*, 22 (1945), No. 8, pp. 229-242).—Selected data are compiled on the most important of the newer potato varieties, older commercial varieties, and varieties prominent in the parentage of these groups or that are otherwise of special interest to plant breeders.

The Potomac potato, R. A. JEHLE and F. J. STEVENSON. (Univ. Md. coop. U. S. D. A.). (*Amer. Potato Jour.*, 22 (1945), No. 9, pp. 261-266, illus. 1).—Potomac, a selection from Rural New Yorker \times Katahdin, is a high-yielding, late-maturing, round white potato with good baking qualities and has moderate vine and tuber resistance to late blight and to the flea beetle, leafhopper, and tipburn complex. At Oakland, Md. it has outyielded the standard Smooth Rural, and at Pocomoke, equaled or surpassed the standard Dakota Red. Preliminary tests indicate that like results may be expected in other localities with similar climate.

Effect of the temperature of the root environment on growth of soybean plants, E. B. EARLEY and J. L. CARTER. (U. S. D. A. coop. 24 expt. stas.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 9, pp. 727-735, illus. 4).—Root temperatures from about 22° to about 27° C. appeared to be most favorable for maximum dry weight production of top and roots when soybean plants were grown under a wide variety of aerial environmental conditions in the greenhouse at Urbana, Ill. Low top : root ratios were obtained under high light intensity conditions, and high

ratios were obtained under low light intensity conditions. In general, the height of soybean plants increased with increasing root temperature from about 2° to about 17°, remained uniform from about 17° to about 27°, and decreased rapidly at 37°.

Sizing whole sugar beet seed to improve germination, F. F. LYNES (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 9, pp. 779-781).—Low germinating sugar beet seed may be improved by grading over the proper size screen. Examination of fractional sizes from $\frac{3}{16}$ to $\frac{1}{4}$ in. and estimating their germination by use of the crack test enables selection of the proper screen size for desired results. Typical results of this procedure applied to 40 seed lots with an average germination of 56 percent show an increase of 25 percent in germination with a loss of 35 percent in weight.

Studies on sweet potato production methods in Texas, R. E. WRIGHT. (Partly coop. U. S. D. A. and other expt. stas.). (*Texas Sta. Bul.* 668 (1945), pp. 15).—Production methods are recommended from experiments since 1938 at the Sweet-potato Investigations Laboratory at Gilmer, Texas, concerned with varieties, seed selection and treatment, growing plants, tillage and cultivation, rotations, fertilizers, planting, harvesting, storage, and use of culls and vines.

Of all varieties tested to date only Porto Rico could be recommended for the table stock market. As much variation in yield may be expected among various strains of Porto Rico as between it and other varieties. Yields evidently can be increased significantly by rigid seed selection practices. The greater yield obtained from use of good seed would more than offset the higher cost. Size or shape of seed stock has had little effect on shape of roots produced in the subsequent crop. Seed plats should be harvested earlier than commercial plants; indications were that early harvested sweetpotatoes will produce the earliest slips and most slips per bushel. Selected seed should be stored in new crates or disinfected old ones, preferably in a compartment separate from the main storage house.

For early plantings 8 bu. should be bedded for each acre, and 4 to 6 bu. for late plantings. Flue-heated, steam, or electric beds all have been satisfactory. Beds heated with electricity or shredded or chopped corn-stalks have been used for early slip production, although the corn-stalk method would be best for the average grower. The bed temperature should be held between 75° and 85° F.

Land should be flat broken, bedded, or disked early to allow decay of organic matter before planting. The crop should be cleaned thoroughly and laid by as soon as the vines begin to run freely. Cultivation later has not increased yields, and operations which resulted in covering or breaking vines reduced yields. Height of the bed or row has not affected materially the yield or grade when the land has been prepared thoroughly; it should be determined by the type of implements available. Yields may be increased by rotation and soil building practices, but cover crops as vetch should follow instead of just preceding sweetpotatoes. From 400 to 600 lb. of fertilizer per acre has proved most profitable, but increased yields were secured from rates up to 1,000 lb. per acre even during dry seasons. On sandy soils, 4-8-8 probably will give best results, yet 4-12-8 and 6-10-7 are also satisfactory. On Bowie fine sand the entire amount could profitably be applied before planting if thoroughly mixed in the drill before bedding. Highest yields might be expected when plants are set out as soon as frost danger passes. No difference in shape or grade was evident when slips and vine cuttings were planted under similar conditions. Spacing from 12 to 18 in. in 3.5-ft. rows has been most economical.

Sweetpotatoes were planted May 1-15, 1940-42, and harvested at about 3-week intervals from September 1-7, with delay of final harvest until after the first killing frost. Yields increased about 20 percent during both the first and second intervals but not significantly in the fourth (last) interval. A rolling coulter attached to the beam of a 12-in. turning plow usually is satisfactory for cutting vines and plowing in one operation. A digger which cut vines and lifted the entire row, built for

tractor operation in 1944, eliminated most of the hand scratching. Artificial heat for curing was uneconomical in storage tests 1940-42. Sweetpotatoes should be stored after curing at 50° to 55° with a relatively high humidity.

Effect of sodium nitrate applied at different periods of the growing season on the yield, composition, and quality of wheat, J. DAVIDSON and R. BUCHANAN. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 9, pp. 722-726).—Sodium nitrate (320 lb. per acre) was applied to Purplestraw wheat at Arlington, Va., at a number of periods during the growing season under conditions in which no definite response with respect to yield was obtained. The protein content increased gradually the nearer the applications were made to the time of heading, and declined again on areas on which applications were made after this stage. The S content followed in general the same course as the protein content. There was no correlation between the protein content and the weight per bushel and weight per 1,000 kernels.

Effect of moisture content, temperature, and length of storage on the development of "sick" wheat in sealed containers, E. P. CARTER and G. Y. YOUNG. (U. S. D. A.). (*Cereal Chem.*, 22 (1945), No. 5, pp. 418-428).—Sick wheat was produced artificially by storing sound soft red winter wheat containing different amounts of moisture in sealed quart jars at various temperatures in temperature-controlled cabinets. Geddes (E. S. R., 89, p. 665) has defined sick wheat as that in which the seed loses its viability and the germ darkens in color and becomes rancid. The proportion of sick kernels in general increased with the moisture content of the grain, and temperature and duration of storage. In most cases there was no visible fungus growth on the wheat. Wheat containing 12.2 percent moisture stored at 40° C. developed sick wheat symptoms when stored 279 days or longer, but not when stored at a lower temperature. A small percentage of sick wheat was produced in 32 days in wheat containing 18.6 percent moisture when stored at 5°, and up to 100 percent sick kernels when stored at higher temperatures and for longer periods. Development of the sick wheat condition in general was accompanied by loss in viability and increase in fat acidity.

Summary of results of seed and legume inoculant inspection for 1944, J. G. FISKE (*New Jersey Stat. Insp. Ser. 18* (1945), pp. 22).—Dealers in New Jersey from whom 3,300 official samples of farm crop and vegetable seed and seeds mixtures were collected in 1944 are listed with compliances and violations; and vendors, crops, inoculations, and numbers of organisms are shown for 32 official samples of legume inoculants collected in 1944.

Poison-ivy, poison-oak, and poison sumac: Identification, precautions, eradication, D. M. CROOKS and L. W. KEPHART (*U. S. Dept. Agr., Farmers' Bul.* 1972 (1945), pp. 30+, illus. 24).—Eradication methods for poison-ivy (*Rhus radicans*), oakleaf poison-ivy (*R. toxicodendron*), western poison-oak (*R. diversiloba*), and poison sumac (*R. vernix*), are discussed with comments on poisoning and its treatment, and descriptions of the above plants and of poison-wood (*Metopium toxiferum*) and small Japanese lacquer-tree (*R. verniciflua*); superseding the information in Farmers' Bulletin 1166 (E. S. R., 44, p. 223).

Herbicidal properties of 2,4-dichlorophenoxyacetic acid applied in dusts containing hygroscopic agents, P. C. MARTE, F. F. DAVIS, and J. W. MITCHELL. (U. S. D. A.). (*Bot. Gaz.*, 107 (1945), No. 1, pp. 129-136, illus. 2).—2,4-Dichlorophenoxyacetic acid (E. S. R., 93, p. 285) was applied in different concentrations (0.5, 1, 2.5, 5, and 10 percent) in dust carriers, at the rate of 4 lb. per 1,000 sq. ft., to Kentucky bluegrass and white clover growing in a mixed stand in greenhouse flats. The 10 percent dusts were also tested on heal-all and lawn pennywort in flats and on narrow-leaved plantain in 3-in. clay pots. There was no marked difference on the basis of the plant responses observed among Pyrax, fuller's earth, and Cherokee Clay as diluents or dust carriers at each of the concentrations indicated. Clover was completely eradicated from bluegrass turf by dust containing 10 percent

of the acid, but bluegrass was severely injured and recovered only slowly. Almost complete eradication (99 percent) was obtained by application of dust containing 5 percent of the acid, and the grass recovered quickly from the slight injury. A minimum concentration of 2.5 percent of the acid was needed to kill an appreciable amount (85 percent) of clover, but no bluegrass injury was observed at this concentration. Heal-all, lawn pennywort, and plantain were likewise killed by application of dusts containing 10 percent of the acid. That addition of hygroscopic agents, such as Carbowax 1500 or glycerin, at the rate of 3 percent markedly increased the effects of the 2,4-dichlorophenoxyacetic acid in dust mixtures was observed in experiments with morning-glory, ragweed, and lambsquarters.

Histological changes in bindweed and sow thistle following applications of 2,4-dichlorophenoxyacetic acid in herbicidal concentrations, H. B. TUKEY, C. L. HAMNER, and B. IMHOFF. (N. Y. State Expt. Sta.). (*Bot. Gaz.*, 107 (1945), No. 1, pp. 62-73, *illus.* 5).—Bindweed and sowthistle were treated with aqueous sprays of 2,4-dichlorophenoxyacetic acid (E. S. R., 93, p. 284) at 1,000 p. p. m. in 0.5 percent Carbowax 1500 during midsummer while growing vigorously. In bindweed, pollen grains were plasmolyzed and disorganized, flowers were arrested in development, chlorophyll formation was checked, and cell division was activated in the large vascular bundles of the leaves. Most of the cells in the leaves were plasmolyzed. Cell division was greatly increased in all cambial zones and phloem regions of the stem and rhizome of bindweed. Enlargement and rupture of cortical cells of the rhizome were conspicuous features. Bindweed root responded more slowly to treatment than other parts, so that changes which had occurred 7 days after treatment were similar but of less intensity than in the rhizome. Starch disappeared from almost all parts of the bindweed flower, but very little hydrolysis of starch occurred in the chloroplasts of the leaves. Disappearance of starch from the endodermis of the stem and the inner cortex of the rhizome and root was correlated with active cell division in the phloem region of these portions. In the rhizome of sowthistle, cells of the cortex were greatly enlarged and often torn. The periderm was ruptured, and disorganized large-scale cell division occurred in the cambial zone and phloem regions. Starch hydrolysis was inhibited in vitro by the action of the acid.

Effect of 2,4-dichlorophenoxyacetic acid on the readily available carbohydrate constituents in annual morning-glory, J. W. MITCHELL and J. W. BROWN. (U. S. D. A.). (*Bot. Gaz.*, 107 (1945), No. 1, pp. 120-129, *illus.* 4).—Plants of annual morning-glory (*Ipomoea lacunosa*) in a greenhouse under conditions favoring vigorous vegetative growth and seed production, were sprayed with an aqueous mixture containing 1,000 p. p. m. of 2,4-dichlorophenoxyacetic acid and 0.6 percent Carbowax 1500. Other morning-glory plants under photoperiod and soil fertility conditions less favorable for vegetative growth were treated similarly. No apparent growth occurred, either in treated plants in a vigorous vegetative condition or in those relatively dormant at the time of treatment. After treatment, total dry weight of untreated plants increased while that of the sprayed ones decreased. Neither vegetative nor dormant plants showed external evidence of gall formation or root initiation as the result of treatment. In sprayed plants, necrosis was first evident in flower buds, and none of these developed mature seeds. Both vegetative and nonvegetative plants died within 3 weeks after treatment. Sugars, starch, and dextrin were essentially depleted within 3 weeks in plants growing vigorously, and also in plants relatively dormant when treated. Carbohydrate reserves (starch and dextrin) were rapidly depleted in flower buds, and also in roots of sprayed plants, a response of significance in connection with use of 2,4-dichlorophenoxyacetic acid in weed control. Sugars in treated plants at first increased above the amount in the untreated ones, then decreased, and they were nearly depleted during the second and third weeks after treatment.

HORTICULTURE

Planting carrot stecklings directly out of storage increased seed yields (*Idaho Sta. Bul. 264 (1945), pp. 18-19*).—The desirability of planting carrot roots for seed production immediately following removal from storage was indicated in experiments conducted at the Parma Branch Station in 1944. The average percentages of stand for roots planted 7 days, 3 days, and immediately after removal from storage were 46.9, 88.1, and 81.4, respectively. The average yield of seed in pounds per acre for the three practices were, respectively, 495.8, 852.4, and 944.7. Immediate planting is considered the ideal practice.

Onion bulbs set upright produce more seed (*Idaho Sta. Bul. 264 (1945), pp. 20-21*).—Records taken on the yield of seed from onions planted October 6, 1943 in three manners showed that there were 25 percent more seedstalks and the average yields were 40 percent greater where the bulbs were set upright than where random planting was used, and that virtual crop failure followed deliberate upside-down planting. Despite the additional cost of upright planting there was a substantial profit from this method.

Suggestions on how to top more onions, J. L. PASCHAL and R. W. ROSKELLEY (*Colorado Sta. Press Bul. 100 (1945), pp. 4, illus. 7*).—With the aid of illustrations, practical suggestions are given on how to top onions quickly and effectively with a minimum of effort.

Pearl Harbor: A tomato variety resistant to spotted wilt in Hawaii, K. KIKUTA, J. W. HENDRIX, and W. A. FRAZIER (*Hawaii Sta. Cir. 24 (1945), pp. 4-7, illus. 2*).—Information is presented on the parentage, development, characteristics of the vine and fruit, adaptability and use of a new tomato variety, Pearl Harbor, which was obtained from a cross of Bounty, a North Dakota Experiment Station production, with BC-10, an F_2 selection of 133-6 \times Red Currant \times 133-6 received from the California Experiment Station.

Nitrogen fertilizers for fruit trees, A. E. MURNEEK (*Missouri Sta. Bul. 489 (1945), pp. 23, illus. 7*).—This general discussion presents information on sources of nitrogen; cover crops for green manure; comparative value and use of the four principal mineral sources of nitrogen, namely, nitrate of soda, sulfate of ammonia, calcium cyanamid, and ammonium nitrate; desirable time to apply fertilizers; relation of fertilizer treatments to biennial bearing; amount of fertilizer required; methods of application; effects of nitrogen fertilizer on foliage and fruit, drought and disease resistance and hardness; and the relation of fertilization to other orchard practices such as pruning.

Blossom thinning sprays show promise (*Idaho Sta. Bul. 264 (1945), p. 18*).—Satisfactory thinning of apple blossoms was obtained in several instances. For example, in a large block of Rome Beauty trees near Emmett, Idaho, trees sprayed to destroy part of the bloom were more effectively thinned than comparable trees thinned by hand after the June drop. Where 1 pt. of sodium dinitroresol (Elgetol 30) was used in 100 gal. of spray, the fruit was slightly larger and the yields greater than on hand-thinned trees, and there was a material saving in cost. It is stated that certain details in use must be worked out more completely before general use of thinning sprays can be recommended.

Measurements of the volatile production of apples, F. W. SOUTHWICK ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.], 71 (1945), No. 7, pp. 279-295, illus. 6*).—McIntosh apples stored at 32° F. evolved about half as much volatile material as comparable apples held at 40°. When the fruits were removed from storage and held at 74°, they emitted more organic vapors in 1 day than they had during 5 mo. of storage. Apples which had been at 40° continued to evolve more volatile material than those held formerly at 32°.

Apples stored in an atmosphere of 5 percent carbon dioxide and 2 percent oxygen at 40° respired and produced volatiles at a slower rate, when removed to room temperature, than similar fruit stored previously in air at 32°. The quantity of volatile material arising from McIntosh apples harvested in 1941 and held at 74° was much higher than that of similar fruit harvested in 1942. Scald was more severe in the 1941-42 than in the 1942-43 season, suggesting that differences in emanations from year to year may be correlated with the amount of scald that will occur under a given set of conditions. Apples which are in the preclimacteric stage may be stimulated by an active agent (ethylene) so that the rate of volatile production as well as respiration is increased.

The removal of organic emanations from the atmosphere surrounding stored apples, F. W. SOUTHWICK. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 71 (1945), No. 7, pp. 297-314, illus. 7).—Of various materials, brominated, activated charcoal approached most nearly the ideal atmospheric washing agent from the standpoint of its ability to remove all the known organic apple emanations. Activated charcoal was distinctly superior to all the oils tested in its ability to remove vapors of ethyl acetate and the organic apple emanations which react with concentrated sulfuric acid. The oils, activated charcoal, alkaline potassium permanganate, and activated sulfuric acid were unable to remove the ethylene from post-climacteric apple vapors. At least sufficient quantities of ethylene remained in the air stream after passing through these materials to hasten the appearance of the respiratory and volatile climacteric of immature apples. Activated charcoal impregnated with bromine was sufficiently reactive at room temperatures to remove ethylene from the vapors arising from ripe apples. The rate of respiration and volatile production of preclimacteric apples were not stimulated by the ethylene in ripe apple vapors after the vapors had passed through the brominated, activated charcoal.

Studies on storage scald of apples; R. M. SMOCK and F. W. SOUTHWICK ([New York] Cornell Sta. Bul. 813 (1945), pp. 39, illus. 4).—Scald, a physiological disorder of the apple fruit, is characterized by a superficial browning of the outer layers of cells of the apple. Varieties vary greatly in their susceptibility, with Rhode Island Greening, Northwestern Greening, and Cortland among the very susceptible. Various tree treatments were made in the orchard to determine their effects on subsequent scald susceptibility in storage. Shading limbs of Rhode Island Greening and McIntosh trees with cheesecloth usually, but not always, reduced the amount of scald in storage. Shading individual fruits with white paper caused an apparent increase in scald. Defoliation, early in the growing season, appeared to reduce scald in many instances. Under the conditions of the study, applications of nitrogen fertilizer did not significantly affect the scald of Rhode Island Greening apples. Preliminary studies indicated a positive correlation between the production of total volatile materials and incidence of scald in the McIntosh apple. Although immature Cortland and Rhode Island Greening apples scalded more than did riper fruits, there was seen no practical solution to the scald problem in this direction.

The use of oiled paper gave a consistent reduction in scald but did not necessarily control scald. One form of wax emulsion gave promising results in the reduction of scald, equaling oiled paper on later-picked fruits. Coating fruit with a commercial grade of mineral oil gave inconsistent results. Delayed storage of Rhode Island Greening may reduce scald, but presents difficulties because delayed storage is likely to cause shriveling and to increase bitter pit.

Scald was apparently increased when the relative humidity was excessively high, and conversely shriveled fruits do not usually scald badly. The vapors emanating from McIntosh apples appeared to increase the amount and severity of scald on

Cortland and Greening apples, more so than did the vapors from ripe Greening apples on less mature fruits.

The most promising of several air-conditioning materials under test was activated carbon to which had been added bromine. Limited trials on a commercial scale appeared to justify further tests of this material.

Raspberry growing in New York: Culture, disease, and insects, G. L. SLATE, R. F. SUIT, and F. G. MUNDINGER (*New York State Sta. Cir. 153, rev. (1945), pp. 64, illus. 17*).—This second revision (E. S. R., 87, p. 520) of this circular presents in a like manner general information on selection of sites, preparation of soil and planting, propagation and planting stock, cultural care, pruning, varieties, diseases and insects and their control, harvesting, marketing, and yields.

Why do hardy raspberries winter-kill? W. G. BRIERLEY. (Minn. Expt. Sta.). (*Minn. Hort.*, 73 (1945), No. 8, pp. 119-121, illus. 1).—Unprotected Latham and Chief canes have at times survived winter temperatures as low as -40° to -45° F., yet on other occasions succumbed under much more moderate temperatures. The author studied various factors that may be concerned and concludes that winter injury is due largely to mild periods of weather which may occur during the dormant period, and not to an inherent lack of ability to endure low temperatures.

Factors involved in loss of hardiness include: (1) Cold weather to break the inherent rest period, (2) a few days with air temperatures above freezing which may bring about a loss of resistance to cold, (3) the initiation of first stages of growth by a few days above 43° , and (4) subsequent low temperatures, particularly sudden drop. Covering canes during winter is conceded to be the only safe way to avoid winter injury.

Fruiting and physiological responses of Marsh grapefruit trees to fertilization, A. H. FINCH and W. T. McGEORGE (*Arizona Sta. Tech. Bul. 105 (1945), pp. 427-454, illus. 7*).—Based on 7 years' study in a Marsh grapefruit planting established at the Yuma Mesa Experimental Farm in 1922, nitrogen was the only element to exert a significant effect on yields. The addition of mineral N regularly increased yields in comparison with trees not so fertilized. The quality of the fruit was not affected by any of the treatments, a result believed to be due in part to the fact that during much of the period of fruit growth and development there was little difference in the N nutrition of the tree. Nitrogen applications tended to increase slightly the N in the peel but decreased the phosphorus in the peel and edible portion. These were the only effects of fertilizer treatment on fruit composition.

Nitrogen was freely absorbed, as measured by the N content of the leaves. None of the fertilizers used suppressed N uptake. The absorption of N suppressed phosphorus uptake. Nitrogen absorption increased calcium uptake, which in turn suppressed potassium. Nitrogen fertilization exerted thus a regulating effect upon the absorption of P, Ca, and K. The application of P or K alone or in combination with each other or with N had no effect on the fruiting behavior of the tree or upon the amount of either element in the leaves or fruit. Calcium applied in the form of calcium nitrate had likewise no effect.

Menthol comes to the hemisphere, H. W. SPIELMAN (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 9, pp. 166-168, illus. 4).—In 1936 there were produced in Brazil only a few pounds of menthol on an experimental basis while estimates for 1944-45 indicate between 440 and 550 tons. Production is largely in the hands of Japanese colonists in the State of São Paulo, and presumably the first plants were introduced directly from Japan. Methods of producing the crop, distilling the oil, and extracting the menthol from the oil are discussed, with comments as to future developments in the industry.

FORESTRY

Hardwood-conifer forest contact zone in Itasca Park, Minnesota, M. F. BUELL and W. E. GORDON. (N. C. State Col. et al.). (*Amer. Midland Nat.*, 34 (1945), No. 2, pp. 433-439, illus. 4).—Studies in an area where maple-basswood stands and spruce-fir stands come into direct contact indicated that the hardwoods are completely unable to invade the spruce-fir area, and therefore of the two types of stand the spruce-fir is more likely to be the climax under present conditions. Light penetration of less than 5 percent, characteristic of the fir canopy, prevented maple-basswood reproduction and ground cover from invading the spruce-fir areas. Soil moisture was not found to be of primary importance in preventing maple-basswood penetration of spruce-fir areas. The dense sod of fir areas was a contributing influence in keeping back the hardwood flora.

Perpetuation of yellow birch in Lake States forests, W. M. ZILLGITT and F. H. EYRE. (U. S. D. A. coop. Univ. Minn.). (*Jour. Forestry*, 43 (1945), No. 9, pp. 658-661).—Yellow birch is at present the most valuable northern Lake States hardwood, with prospect of continuing value. Surveys indicate that yellow birch, following ordinary commercial clear cutting of northern hardwoods, maintains itself in the second-growth stand in about the same proportion as in the original stand.

Light selection cuttings where an even canopy is maintained are unsuited to yellow birch regeneration because the birch cannot compete under shade with the more tolerant species, especially sugar maple. Moderate selection cuttings with openings resulting from the removal of small groups of poor-risk trees without regard to seed trees are also unsuccessful in maintaining yellow birch. However, where light partial cuttings are practiced in Lake States stands, a group-selection method in which openings up to 0.1 acre in size are crated within seeding distance of seed trees permits the successful reestablishment of yellow birch.

Prediction of site index for yellow poplar from soil and topography, J. T. AUTEN. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 9, pp. 662-668, illus. 2).—Included in the study were 77 second-growth yellow poplar stands from 12 to 61 yr. of age on old field and cut-over areas in Ohio, Indiana, Illinois, Kentucky, and Tennessee. With three exceptions all were natural stands. The species was shown to require special qualities of site such as deep, permeable, well-drained but moist soil, and shelter from drying winds. No correlation was found between site index and calcium, magnesium, phosphorus, and potassium content of the soil. Site index was not related to the pH value of the soil of any horizon. Depth of soil to tight subsoil was directly correlated with site quality, with soils less than 24 in. deep over subsoil of pronounced density being poorer than average for yellow poplar. Thickness of the upper organic enriched mineral horizon in undisturbed soil was also directly related to site index.

On a site-index scale with 100 as the average maximum, stands on poor, fair, and good drainage rated 56, 83, and 95, respectively. Site index on soils with blue-gray or drab and yellow mottled subsoils averaged 58, whereas site index on soils with yellow, brown, and reddish-brown subsoils averaged 88. Two tables are presented for evaluation of site quality.

Viable seed produced by 12-year-old red pine, E. J. ROE. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 9, pp. 678-679).—Cones picked in November 1944 from two red pine trees, set in 1935 when 2 yr. old, were found to contain some viable seed capable of development into normal seedlings.

Some results of thinning fifteen-year-old red pine, T. SCHANTZ-HANSEN. (Minn. Expt. Sta.). (*Jour. Forestry*, 43 (1945), No. 9, pp. 673-674).—Remeasurements in 1932 and 1937 on four thinning and a control plot established in 1927 in a

15-year-old stand of red pine showed some advantage in diameter growth for the 7×7 ft. spacing, but in 1942 the 9×9 ft. spacing had assumed the lead. The poor diameter growth of the unthinned control plot indicated that thinning had stimulated growth in the released trees. Differences observed in height growth in 1937 were due apparently to slight differences in site quality, and these differences were beginning to disappear in 1942. Current height growth in the control plot indicates that overstocking was slowing development.

There was no loss of trees in the thinned plots between 1937 and 1942. In the same period the control plot lost 1,160 trees, indicating a severe struggle for survival.

Variation between two hybrid poplars in susceptibility to the inhibiting effect of grass and weeds, E. J. SCHREINER. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 9, pp. 669-672, illus. 5).—In connection with a previously reported experiment (E. S. R., 93, p. 588), two hybrid poplar clones bred from the same female parent, *Populus maximowiczii*, but with different pollen parents were compared as to their inherent capacities to grow in sod. Although there were some differences in growth and survival of the two clones, the inhibiting effect of the sod was so great on both as to indicate that there is only a remote possibility of discovering clonal types of hybrid poplars that can be established successfully on sod land with soil preparation. The author suggests that hardwood species which volunteer naturally on abandoned fields may possess greater inherent resistance to competing grass and weeds, and that with such species there may be possibilities in breeding and selection of clonal variants capable of successful establishment on abandoned farm land.

Appalachian hardwood trees browsed by cattle, H. H. BISWELL and M. D. HOOVER. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 9, pp. 675-676).—During the summers of 1941 and 1942 a 145-acre area of forest land in the Coweeta Experimental Forest, N. C., was grazed very heavily to determine which plants are preferred by cattle and to what extent trees are browsed.

The cattle showed a definite preference for the herbs, and these were grazed closely before the trees were eaten to any extent. Among trees yellow poplar, black locust, ash, sourwood, and sweet birch were preferred. Many of the small trees of the preferred species were killed. The grazing capacity of the tract declined rapidly from 1,000 cattle days in 1941 to 500 days in 1942.

Bamboo in Ecuador's lowlands, F. A. MCCLURE (U. S. Dept. Agr., *Agr. in Americas*, 5 (1945), No. 10, pp. 190-192, 194, illus. 5).—Information is presented on types of bamboo grown, cultural practices, uses in house construction, furniture and fish trap manufacture, source of drinking water during the dry season, etc.

Volume-growth slide rule, S. R. GEVORKIANTZ and E. E. AAMODT. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 9, pp. 652-653, illus. 2).—The authors discuss the construction and operation of a special slide rule which they have devised for quick and simple computation of volume and growth directly in the field.

DISEASES OF PLANTS

The Plant Disease Reporter [July 15 and August 1-15, 1945] (U. S. Dept. Agr., *Plant Disease Rptr.*, 29 (1945), Nos. 22, pp. 575-621, illus. 5; 23-24, pp. 623-657, illus. 2).—In addition to brief seasonal survey notes from the Emergency Plant Disease Prevention Project relating to such plants as cereals, forage crops, potatoes, apple and pear, and vegetable crops, the above issues contain the following signed notes and articles:

No. 22.—Host-parasite check list revision—*Sphenopholis-Trisetum* (Gramineae), by F. Weiss; cereal diseases in Delaware and Maryland in 1945 by A. J. Mix, in Nebraska by C. M. Slagg, and in Kansas at the beginning of June by C. O. Johnston and during the middle of June by S. M. Pady; cereal disease survey in Kentucky, by L. M. Josephson (Ky. Expt. Sta.); cereal diseases and diseases and injuries of

forage legumes and grasses in Wisconsin, both by E. E. Honey, J. G. Dickson, F. R. Jones, and J. L. Allison (Univ. Wis.); diseases of small grains in southern Minnesota and South Dakota, by I. W. Tervet; bacterial blight of orchard grass observed in Oregon, by J. R. Hardison (Oreg. Sta.); the strawberry red stele situation in Maryland, by W. F. Jeffers (Univ. Md.); symptom expression of rusty mottle in Utah sweet cherry orchards, by A. S. Rhoads; a wilt (apparently fungus) disease of Persian walnut in California, by E. E. Wilson (Univ. Calif.); surveys and observations on verticillium wilt of guayule in California from 1943 to 1945, by H. Schneider; sugarcane mosaic in Mississippi, by D. C. Bain; and an unusual distribution of a rust—an *Aecidium* on *Lippia berlandieri*, by W. V. Eisenberg.

No. 23-24.—Host-parasite check list revision—*Triticum* (Gramineae), by F. Weiss; stem rust in North and South Carolina and small grain disease surveys (with tabulation) in the Carolinas, both by A. E. Prince; diseases of wheat and oats in Kansas, by S. M. Pady; condition of cereals in North Central States, by D. G. Fletcher; take-all disease on rye and wheat in Illinois, by B. Koehler (Univ. Ill.); aphanomyces root rot of lettuce, pepper, and eggplant seedlings in northern New Jersey, by A. J. Mix; control of lettuce gray mold with thiosan, by J. S. Niederhauser (Cornell Univ.); and onion leaf "blight" reduced by spraying, by G. H. Godfrey (Tex. Sta.).

La défense des plantes cultivées [Protection of cultivated plants], H. FAES, M. STAEHELIN, and P. BOVEY (Lausanne: Libr. Payot, 1943, pp. 510, illus. 392).—The first or general part considers parasites of animal, plant, and virus origin and general control measures, including fungicides and insecticides. The second or special part takes up the diseases and pests of grapes, fruit trees, and field and garden crops. A tabulation of the pests and diseases—giving the French, German, and Italian common names and the Latin binomials—is included, and a subject index is provided. The illustrations include eight colored plates. The preface is by A. Chaponnier.

The occurrence of mineral nutritional diseases of plants and animals in the United States, K. C. BEESON. (U. S. D. A.). (*Soil Sci.*, 60 (1945), No. 1, pp. 9-13, illus. 3).—Area patterns (2 maps) for the occurrence of nutritional troubles with respect to particular plant species and believed to be caused by deficiencies of B, Mn, Zn, Cu, or Fe are presented for the United States. The occurrence of nutritional troubles in animals is plotted (map) with respect to the particular element—P, Ca, Co, Cu, Fe, I, or Se—believed to be involved. Areas for the occurrence of nutritional diseases in animals cannot as yet be outlined, though more frequent and accurate diagnosis of both acute and subacute troubles will undoubtedly aid in defining them more closely in the future.

Estudo dos virus das crucíferas.—II, *Estirpes isoladas de Matthiola incana* (L.) R. Br. [Study of the crucifer virus.—II, Strains isolated from *M. incana*], M. DE L. D'OLIVEIRA and M. DE L. BORGES (Bol. Soc. Broteriana, 2. ser., 19 (1944), No. 1, pp. 265-272).—Includes inoculations to various host plants.

On the occurrence of *Colletotrichum capsici* in China, L. LING and K. R. LIN (*Indian Jour. Agr. Sci.*, 14 (1944), No. 2, pp. 162-167, illus. 2).

A new *Dacrymyces*-like parasite of *Arundinaria*, L. S. OLIVE. (U. S. D. A.). (*Mycologia*, 37 (1945), No. 5, pp. 543-552, illus. 35).—This leaf parasite of switch cane (*A. tecta*) is described as *Dicellomyces gloeosporus* n. gen. and sp. It resembles *Dacrymyces* in certain characters but differs from all other genera of the *Dacrymycetaceae* in its persistent probasidia, basidia produced externally to the gelatinous matrix, and relatively short sterigmata. The parasitic and phragmobasidial nature of the fungus and its possession of persistent probasidia are believed to be primitive characteristics pointing to the origin of the group from rustlike ancestors.

Some studies on *Macrophomina phaseoli* (Maubl.) Ashby in Ontario, A. A. HILDEBRAND, J. J. MILLER, and L. W. KOCH (*Sci. Agr.*, 25 (1945), No. 11, pp. 690-706, illus. 8).—Two isolations of this fungus—one locally from charcoal rot of soybean and the other from a diseased cotton plant from Texas—were compared. When stems of soybean growing in the greenhouse were injured and inoculated with the Ontario strain it acted as a facultative parasite; pycnidia and sclerotia were produced on a few plants. When corn and soybeans were grown at 21°, 27°, and 33° C. in sterilized soil inoculated with the two strains, such parasitic activity as both strains displayed was, on corn, of the facultative type; in attacking the underground parts of soybean stems and inducing the characteristic infection areas, the two strains displayed definite but limited capability as primary parasites. Infection appeared first on plants grown at the two higher temperatures. When under similar controlled conditions the stems of corn and soybean were injured and then inoculated with the two strains at the soil level, 8 corn and 7 soybean plants out of a total of 102 became infected and all but 1 were under the higher temperatures. Since 14 of the 15 affected plants had been inoculated with the Ontario strain, there was a suggestion of host specificity; parasitism in all cases was facultative.

Neither strain in culture produced pycnidia, but these did appear on some of the greenhouse-grown plants inoculated with the local strain; pycnidia and conidia are described. Cultures of single-conidial origin produced the sclerotial stage; thus was established for the first time by the pure-culture method the genetic connection between the two stages of the organism occurring on soybean; on the basis of the morphology of its pycnidia, conidia, and sclerotia it was definitely identified as *M. phaseoli*. The two strains were differentiated by the size and number of sclerotia in culture. Sclerotia of both strains exhibited an apparent loss of viability that increased with age in culture; in marked contrast, sclerotia from the original soybean herbarium specimen showed no loss in viability after 8 mo. The parasitism of *M. phaseoli* in relation to certain biotic and abiotic factors is discussed. There are 16 references.

Development of spore-forms and the nuclear cycle in the autoecious opsis rust, *Cystopsora oleae*, M. J. THIRUMALACHAR (*Bot. Gaz.*, 107 (1945), No. 1, pp. 74-86, illus. 28).—*C. oleae* has both 2- and 4-celled promycelia; it is an autoecious opsis form causing hypertrophy and witches' brooms on young leaves and twigs of *Olea dioica*. Infection patches on which telia form are, however, not malformed. Teliospores germinate in situ without a rest period; fusion occurs in mature spores. The promycelium is formed by extension of the lower part of the teliospore; the syncaryon moves into it and divides twice. When the promycelium is 4-celled the cells are uninucleate but are binucleate when it is 2-celled. The sporidia are always binucleate. The pycnium is borne on a diploid thallus. Formation of aeciospores within the pycnia was observed many times. When aeciospores were sown on young leaves they invariably gave rise to pycnia, although they have never been observed to form promycelia and sporidia. When older leaves were infected, teliospore development took place after a lapse of several weeks. This rust fungus thus presents certain characteristics not previously reported among other rusts and appears to be very unstable. The diagnostic characters of the genus and species are emended.

The Ustilaginales or "smuts" of Washington, G. W. FISCHER and E. HIRSCHORN. (Coop. U. S. D. A.). (*Washington Sta. Bul.* 459 (1945), pp. 84, illus. 53).—Approximately a fifth of the smuts reported for North America are said to occur in Washington State. The primary purpose of this contribution is to provide an illustrated manual for plant pathologists, agronomists, mycologists, teachers, students, county agents, and other interested persons in the northwestern part of the United States.

The nematocidal and fungicidal value of D-D mixture and other soil fumigants, G. K. PARRIS. (Va. Truck Expt. Sta.). (*Phytopathology*, 35 (1945), No. 10, pp. 771-780).—D-D mixture was discovered to be effective against *Heterodera marioni* at rates as low as 150 lb. per acre; in limited comparisons—using bush, snap, and lima beans, tomatoes, potatoes, and celery—it equaled chloropicrin. Two materials chemically similar to D-D mixture, monochlorobutenes and trichlorobutenes, appeared to possess no nematocidal values at 150 lb. per acre. D-D mixture was apparently of little value as a fungicide in soil disinfestation studies of the damping-off fungi *Rhizoctonia* sp. (probably *R. solani*), *Fusarium* sp. (probably *F. martii*), *Pythium aphanidermatum*, and *F. oxysporum* f. *lycopersici*. Dosages as high as 550 lb. per acre were not fungicidal to *Pythium*, and dosages as high as 1,000 lb. per acre did not control the other fungi. D-D mixture is slightly injurious to plants when they are set out in treated soil too soon after treatment. At 150 lb. per acre no injury has been found if 2 weeks elapse between treatment and time of planting. In cold soils, the time interval for safety may be 3 weeks or longer; limited studies indicate the time interval to vary with dosage as well as with the particular plant used. Lettuce has been injured when celery was undamaged. When D-D mixture is applied to cold soil (30°-40° F.) its effectiveness as a nematocide does not seem to be impaired.

Razas fisiológicas de la roya negra del trigo (*Puccinia graminis tritici*) encontradas en el Perú [Physiological races of black stem rust in Peru], V. A. REVILLA ([Peru] Min. Agr., Dir. Gen. Agr. Bol. 26 (1945), pp. 16+, illus. 4; Eng. abs., p. 14).—Races 14 and 15 are reported from the coastal and sierra regions of Peru, in addition to those previously observed for the country. Race 15 is said to be the most virulent and the one most widespread.

Studies on smut-resistant oats for Kansas, E. D. HANSING, E. G. HEYNE, and L. E. MELCHERS. (Kans. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 6, pp. 499-508).—The collections of smut fungi made in Kansas are placed in three groups: (1) Richland smut, *Ustilago avenae* and *U. kollerii*; (2) Fulghum smut, *U. avenae* and *U. kollerii*; and (3) Fulton smut, *U. avenae*. Kanota, a strain of Fulghum that is resistant to the Richland smut, was distributed in Kansas in 1919 as a smut-resistant variety, but later appeared susceptible as the Fulghum smut increased. Fulton, a selection from a cross Fulghum × Markton made in 1926 is resistant to the Fulghum and Richland smuts and was distributed in Kansas in 1939. In 1934 a new physiologic race of smut was found to which Fulton, Columbia, and Marion were intermediate in susceptibility. Kanota and Fulghum were susceptible to the Fulton smut, whereas Richland, Markton, Trojan, Brunner, Otoo, New Nortex, Tama, Boone, Fultex, and Victoria were highly resistant to this race and to the Fulghum and Richland smuts. The Fulton smut has not increased to any extent even though susceptible varieties comprise about 85 percent of the total acreage sown to oats in Kansas. Selections from the crosses Fulton × (Victoria × Richland) and (Fulghum × Markton) × (Victoria × Richland) have been made that are resistant to crown and stem rust as well as smut. Osage and Ventura, two promising strains from the cross Fulton × (Victoria × Richland) proved to have the same smut reaction as Fulton, whereas Neosho and CI. 4140, selections from (Fulghum × Markton) × (Victoria × Richland) were highly resistant to the three groups of smut. Osage and Neosho have been distributed to Kansas farmers for increase in 1945.

Studies on *Ascochyta imperfecta*, a seed- and soil-borne parasite of alfalfa, M. W. CORMACK (*Phytopathology*, 35 (1945), No. 10, pp. 838-855, illus. 2).—In field, greenhouse, and laboratory studies this fungus—cause of black stem in alfalfa—was found to parasitize the roots and seedlings of alfalfa and the roots of other legumes and to be both seed- and soil-borne. *Medicago sativa* was more susceptible

to stem, leaf, and root infection than any other host studied; *Melilotus* spp. and *Trifolium pratense* were slightly susceptible and *T. hybridum* was rather resistant. Occasionally the pathogen was isolated from stems of *Vicia americana* and leaves of *Lathyrus* spp. Cool moist conditions were most favorable for disease development on stems, leaves, and seedlings of alfalfa; roots of dormant plants at soil temperatures near freezing were not attacked. New Improved Ceresan at 1 percent ethyl mercury phosphate and Arasan were more effective against the disease than other seed treatments tested. The fungus was prevalent in the surface soil of alfalfa fields, but disappeared 2 yr. after the sod was plowed. Moreover, it was not isolated from the soil of cereal rotations, virgin prairie, or virgin woods. It persisted on dry stems and leaves of alfalfa for at least 5 yr. and on alfalfa seed for about 3 yr. Various Ascomycetes, including a *Pleospora* closely resembling *P. rehmanniana*, were found associated with the pycnidia of *A. imperfecta* on overwintered stems of alfalfa, but in no case was proof of a genetic connection established. There are 17 references.

Parasitism of *Rhizoctonia solani* from alfalfa, O. F. SMITH. (Nev. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 35 (1945), No. 10, pp. 832-837, illus. 1).—The California Common alfalfa variety was inoculated with isolates from other plant species, and the latter were inoculated with a strain of *R. solani*, causing a root canker in alfalfa. Isolates from root cankers of alfalfa caused abundant root lesions when reinoculated to alfalfa; except for isolate R-216—only weakly pathogenic and producing very few lesions on alfalfa—those from other plants produced no lesions at all on alfalfa roots. Isolate 102, causing root lesions on alfalfa, was pathogenic on roots of Bard vetch, Berseem clover, guar, Hubam sweetclover, sour clover, Madrid Evergreen sweetclover, and Cumberland red clover. It also was pathogenic on stems of Canada field pea.

Root-rot of cocoyams (*Xanthosoma sagittifolium* Schott), A. F. POSNETTE (*Trop. Agr. [Trinidad]*, 22 (1945), No. 9, pp. 164-170).—A series of field experiments are reported to have confirmed earlier work and produced evidence that ordinary culture methods do not reduce the incidence of root rot. Roguing of all "wild" cocoyams (yautia malanga) immediately after clearing new land and then replanting with healthy sets delays the disease so that one crop may be obtained. A satisfactory yield may be had by controlling "bush" shade without clearing or disturbing the soil, but cocoyams in the bush are not immune to this disease. Once attacked, plants may carry the disease to other soils.

Pot experiments gave evidence that spread of the disease is not due to a progressive change in the soil, such as the development in situ of a toxin. The disease may be carried by corms which have been surface-sterilized and from which all roots have been removed. The infection may be transmitted by gently rubbing an extract of apparently healthy roots from diseased plants with carborundum powder onto the roots of healthy plants. The disease may be transmitted through leaf petioles "grafted" together. Variety trials have indicated that only *X. violaceum* variety Yautia Palma among those tested is resistant, but that further individual plant selection among local varieties has possibilities. That the primary cause may be a virus which causes lesions on the roots and renders the plant susceptible to a variety of weak parasites often present in the soil is suggested as a useful working hypothesis for further investigations.

Important diseases of corn in Nebraska, J. E. LIVINGSTON (*Nebr. Agr. Col. Ext. Cir. 1804* (1945), pp. 8, illus. 7).—An informative leaflet, with illustrations in color.

Sobre a queima do algodoeiro no nordeste [Blight of cotton in northeastern Brazil], J. A. DESLANDES (*Bol. Fitossanitário*, 1 (1944), No. 1, pp. 3-18, illus. 9).—A general study of infection by *Fusarium vasinfectum* f. 1 Wr. and its control in this region—illustrated by five colored plates.

Viability and infection of light and heavy cotton seeds, C. H. ARNDT. (S. C. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 35 (1945), No. 10, pp. 747-753).—Seeds of upland cotton were acid-delinted and separated into floaters and sinkers on the basis of their specific gravity relative to water. The floaters comprised 4 to 94 percent of the total seed weight; their relative proportion was determined more by varietal characteristics than by viability of the seed, internal fungus infection, or crop year. Varieties with high seed weights tended to have the greatest percentages of floaters; removal of occluded air changed most of them to sinkers. The viability of the floaters tended to be less than that of the sinkers when the proportion of floaters was small; when the percentage of floaters exceeded that of the sinkers, the viability of both was about the same. The general applicability of water-grading to improvement of seed quality in cotton is considered questionable.

A leaf spot of cowpea and soybean caused by an undescribed species of *Helminthosporium*, L. S. OLIVE, D. C. BAIN, and C. L. LEFEBVRE. (U. S. D. A. and La. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 10, pp. 822-831, illus. 4).—An apparently new species of *Helminthosporium*, here described as *H. vignae* n. sp., was found to cause a severe leaf spotting of cowpeas, with stem infections taking place late in the season; it also causes a light spotting of soybean leaves. Two parasitic races have been isolated: Race 1, from cowpea leaves, causes a severe leaf spotting of cowpeas and a light spotting of soybeans; race 2, from soybean leaves, produces a light spotting of soybean leaves and a few to many small specks of little consequence on cowpea leaves. The occurrence of primary outbreaks near ports of entry suggests recent introduction from abroad.

Threshing-injury to flax seed in Canada, J. E. MACHACEK and A. M. BROWN (*Sci. Agr.*, 25 (1945), No. 10, pp. 601-625, illus. 4).—In Canada, flax seed is often fractured when threshed during dry weather; in some lots all kernels may be fractured, though these injuries are usually so small that their presence does not affect the market grade. The large-seeded varieties appear more subject to such injury. When fractured kernels are planted in ordinary soil many of them rot from invasion by soil-borne organisms. The frequency of such rot seems to be greater in heavy than in light soils but apparently is not affected by variations in soil temperature. Losses from rotting of fractured kernels are generally less severe in the field than in the greenhouse. Seed treatment was found to prevent the decay of fractured kernels in nonsterile soil. In heavy soils, New Improved Ceresan applied at 1.5 oz. per bushel gave the best results; prolonged storage of seed was sown in the field, it germinated better than fractured seed, but the resulting causes no such effect in nonfractured seed. Treatment of flax seed with heavy dosages of Spergon may result in postseedling damage. Though seed treatment generally improved the germination of fractured seed in experimental plots, the improvement did not always result in improved yields. Similarly, when nonfractured seed was sown in the field, it germinated better than fractured seed, but the resulting yields were often at the same level.

Symptoms of copper deficiency in flax, C. R. MILLIKAN (*Roy. Soc. Victoria, Proc.*, n. ser., 56 (1944), No. 1, pp. 113-116, illus. 3).—Wheat and flax plants in Cu-deficient water cultures developed severe malnutrition symptoms, those in wheat being the same as in the "reclamation disease." Flax showed a general chlorosis and somewhat rosetted appearance of the tops from shortening of the internodes; the leaves became puckered, slightly enrolled along the edges, and much twisted. Growth finally ceased, and the plants commenced to die from the top.

Wilt disease of flax, C. R. MILLIKAN (*Jour. Dept. Agr. Victoria*, 43 (1945), Nos. 7, pp. 305-313, illus. 9; 8, pp. 354-361, illus. 5).—Severe wilt is reported in flax grown in the Drouin district of Victoria on land overcropped with flax, the disease not becoming apparent until October or later. The associated fungus was

identified as *Fusarium lini*. The symptoms are described. In soil temperature studies, the minimum was about 55° and the disease was favored by temperatures up to 75° F. Susceptible plants growing in spontaneously infested soil escaped the disease in their earlier stages when the soil temperature was below 55°, but invariably succumbed when it was 75° at any time up to at least 20 weeks after germination. In the field, the occurrence of wilt in susceptible flax growing in infested soil depended solely on the prevailing soil temperatures. The reactions of numerous flax varieties growing in infested soil was studied; several exhibited a high degree of resistance. Though most varieties showed similar reactions in the two spontaneously infested soils used, there were several in which different reactions were recorded, suggesting the possibility of more than one strain of the fungus. The Liral Crown selections have proved highly resistant in both winter and summer sowings in infested soil; the Liral Prince has also proved highly resistant in a winter sowing. One Victorian strain of *F. lini* was compared in temperature tank tests with two strains from New Zealand and one from Minnesota; from the results it is concluded that the local fungus is distinct from the three overseas strains. The need for testing new flax varieties to as many races of *F. lini* as possible before release is stressed from the results of the present findings. There are 33 references.

Hop disease in Great Britain, W. G. KEYWORTH (*Wallerstein Labs. Commun.*, 8 (1945), No. 24, pp. 99-109, illus. 13).—A brief conspectus, including those diseases due to fungi and viruses.

Potato diseases in Nebraska, J. H. JENSEN and J. E. LIVINGSTON (*Nebraska Sta. Bul.* 378 (1945), pp. 47, illus. 17).—This compendium of information on potato diseases and their control in Nebraska considers those affecting seed piece and sprouts and the growing plant; wilting, yellowing, and premature death due to fungi and bacteria; leaf spots due to fungi; viruses diseases; diseases due to unknown causes, to the feeding of insects, and to unfavorable growing conditions; and diseases of the tubers. Sections are also included on general control methods, selection of seed, seed treatment and handling, wound healing of cut seed, crop rotation, time of planting, spraying and dusting, handling, storing, and shipping, and seed potato certification and the terms used.

DDT and other new materials for spraying potatoes, J. P. SLEESMAN, H. L. GUR, and J. D. WILSON. (Ohio Expt. Sta.). (*Amer. Potato Jour.*, 22 (1945), No. 8, pp. 242-250).—In the tests reported for 1944, DDT gave the most outstanding performance of any material recorded for use on potatoes during the past 25 yr. Used alone and in combination with various fungicides, it gave remarkable control of the potato leafhopper, exceptional flea beetle control, and significantly higher yields (at the 1 percent level) than those secured with any other treatment used; its influence on leaf character and vine vigor was also outstanding. Furthermore, it seems highly probable that use of DDT will eventually bring about important changes in potato spray formulas and practices. In the meantime, more information on dosage, residual efficiency, spray intervals, etc., must be obtained. Methasan gave results comparable to those obtained with bordeaux mixture. In the 1943 tests, Dithane gave the highest yield in a test comparing 26 formulas; its poor performance in 1944 may be attributed, in part at least, to an inferior formulation. Fermate used as a spray gave poor leafhopper control and low yields; significantly better results were obtained when it was applied as a dust. Addition of calcium arsenate to bordeaux, COC-S, and CAC sprays applied to muck-grown potatoes failed to give significantly larger yields than with these materials used alone, but application of the several fungicides in combination with calcium arsenate to upland-grown potatoes usually resulted in some increase in yield. A dust mixture of COC-S + calcium arsenate + talc carefully applied under optimum conditions and at 80 lb. per acre—to cover all foliage completely—gave results comparable to

those from bordeaux spray. Of the fixed coppers, chlorides were the most effective in controlling potato pests, but in Ohio the results were not quite as good as those from bordeaux.

Blight immune potatoes, D. REDDICK and L. C. PETERSON. ([N. Y.] Cornell Expt. Sta.). (*Potato World*, 14 (1945), No. 5, pp. 1-3).—This is a brief summary of the potato breeding work at the station, along with the announcement that one of the promising "blight-proof" seedlings was released in 1945 under the name "Empire"; every effort is being made to increase the variety as rapidly as possible. A warning is sounded on the building up of virulence in the late-blight fungus when it is subjected to increasingly resistant potatoes.

Weeds and the aphid-leafroll problem in potatoes, G. W. SIMPSON, W. A. SHANDS, and O. L. WYMAN. (Coop. Maine Expt. Sta. and U. S. D. A.). (*Maine Agr. Col. Ext. Bul.* 333 (1945), pp. 20, illus. 8).—This bulletin presents information on the seasonal history of aphids affecting potatoes, their winter and summer host plants, factors influencing the relative importance of the various weeds as summer hosts of the aphids, aphid movements and the spread of diseases, factors behind the serious aphid infestations of recent years, and recommendations on what to do about the weeds that serve as sources of infection for the aphid vectors of the virus leaf roll disease.

Notes on the leaf roll and mosaic diseases of potatoes in relation to seed potato production, P. E. M. CLINCH, J. B. LOUGHNANE, and R. MCKAY ([Ireland] *Eire Dept. Agr. Jour.*, 41 (1944), No. 2, pp. 263-276, illus. 11).—The X, A, and Y viruses are said to be chiefly responsible for the mosaic diseases of potatoes in Eire; certain varieties are "intolerant" to X and/or A and do not become infected with them in the field; all are liable to infection by Y under field conditions. Virus X alone is usually mild, but some strains produce severe mosaic; this virus spreads in the field by contact between the leaves. Virus A is spread by the green peach aphid and under natural conditions produces a mosaic effect similar to that induced by the milder strains of X. Combined infection with X and A results in crinkle, the commonest severe mosaic in Eire. Virus Y is spread freely by the green peach aphid and causes severe effects in all but a few varieties. Infected stocks should be eliminated and care taken not to overlook mosaic symptoms in the mild-reacting varieties. Combination with X aggravates the effects of Y. Viruses F and G produce tuber symptoms in a number of varieties; effects on the foliage are relatively harmless unless in combination with X. Dry conditions aggravate the symptoms of leaf roll and certain mosaic viruses. All varieties are susceptible to leaf roll, which is spread by the green peach aphid.

Pink rot disease of potatoes in British Columbia, W. JONES (*Sci. Agr.*, 25 (1945), No. 10, pp. 597-600, illus. 2).—The causal fungus, *Phytophthora erythroseptica*, was isolated from diseased tubers from the Okanagan district, B. C. Symptoms in those inoculated were a dark discoloration of the lenticels, dullness of the skin, and purplish discoloration of the eyes; the flesh on cutting was dirty white, turning to pale pink, and then to salmon pink within $\frac{1}{2}$ hr. The fungus proved pathogenic to tubers of the varieties Warba, Epicure, Irish Cobbler, White Rose, Netted Gem, Burbank, Green Mountain, Columbia Russett, and Sequoia; all appeared equally susceptible. Plants grown in inoculated soil developed symptoms in the mother tubers and in young tubers, as well as necrosis of stolons, sprouts, and basal parts of the stems, and wilt of some of the leaves toward the end of the growing period. The optimum growing temperature of the fungus was about 24°, the minimum 4°-8°, and the maximum below 34° C.; the optimum for development of the disease in Burbank tubers was about 25°. Control consists in crop rotation, destruction of diseased refuse, and careful grading of the crop before storing or marketing.

Leak, caused by *Pythium debaryanum* Hesse, produces typical "shell rot" of potato in Idaho, E. C. BLODGETT and W. W. RAY. ([Idaho Expt Sta.] and U. S. D. A.). (*Amer. Potato Jour.*, 22 (1945), No. 8, pp. 250-253, illus. 1).—The purpose of this brief note is to point out that leak has been known for a long time as a disease of early potatoes in Idaho but has not previously been regarded as a disease in stored potatoes, and that it has not heretofore been regarded as belonging to the shell rot complex although it is now considered that leak is the principal cause of typical shell rot as known by potato men generally in the State. It probably has been present in varying amounts as long as potatoes have been grown in Idaho. This information can be of value in extension work since the term shell rot has also been used—with much less accuracy—in connection with black rot and dry rot (*Fusarium* spp.), ring rot (*Corynebacterium sepeidomicum*), and black leg (*Erwinia phytophthora*).

Cancro de batata—Synchytrium endobioticum (Schilb.) Perc. [Potato wart], N. B. FAGUNDES (*Bol. Fitossanitário*, 1 (1944), No. 1, pp. 37-41, illus. 2).—A brief account on the distribution, host plants, symptoms, the causal fungus, and control of this disease.

Potato root eelworm in Yorkshire, L. R. JOHNSON and H. W. THOMPSON (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 52 (1945), No. 6, pp. 266-270, illus. 1).—A brief account of investigations of the potato eelworm populations in the area, the effect of cyst population on the crop, and the build-up of numbers by cropping.

Physiology of *Cercospora sesami* Zimm., S. CHOWDHURY (*Jour. Indian Bot. Soc.*, 23 (1944), No. 3, pp. 91-107, illus. 9).—*C. sesami* parasitizes the leaves, petioles, stems, and pods of *Sesamum indicum*; its morphology, reactions in culture, pathogenicity, and the symptoms induced on inoculation are described.

The sooty stripe disease of sorghum, D. C. BAIN. (La. State Univ.). (*Phytopathology*, 35 (1945), No. 9, pp. 738-739, illus. 1).—*Titaospora andropogonis*—recently reported on varieties of sorghum in the United States—appears to be spreading in Louisiana and Mississippi. The fungus and the disease it causes are described. Infection spots on *Sorghum* spp. resulted from inoculations made in the field, but typical symptoms as they appear in nature were not obtained. Spots attained their maximum size on the varieties White Kaoliang, C. P. Special, Standard Broomcorn, and Dwarf Yellow Milo.

Cotton-leaf-spot *Rhizoctonia* and its perfect stage on sugar beets, J. E. KOTLA. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 9, pp. 741-743, illus. 1).—This *Rhizoctonia* was found to induce a postemergence type of damping-off in sugar beet seedlings, reducing stands to 61.5 percent of controls; it proved nonpathogenic to older roots. The fungus was weakly parasitic on sugar beet leaves kept at 21°-25° C. and 95-100 percent relative humidity. Under these conditions the fungus grew over the surface of the leaves and formed the perfect stage as a rather loose structure and readily removable for examination. The basidiospores—four per basidium—averaged $8.8\mu \times 6.9\mu$; this and other characters place the fungus as *Pellicularia filamentosa*.

The relation of the occurrence of foliage symptoms of chlorotic streak of sugar cane to the distribution of the virus in the plant, E. V. ABBOTT. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 9, pp. 723-736, illus. 2).—The loss of foliage symptoms of this virus disease was studied in four sugarcane varieties. Plants became symptomless through loss of the streaked leaves by senescence and temporary or permanent failure of symptoms to appear in those subsequently produced. Well-defined streaks, however, failed to disappear from the leaves. On the whole, the extent of infection of the buds was correlated with the severity of foliage symptoms and was greater in plants bearing symptoms continuously than in those that showed temporary or permanent loss of symptoms. Loss of foliage

symptoms, however, was not necessarily associated with disappearance of the virus from the stalks. Some buds from infected stalks produced apparently healthy plants on germination. This was assumed to result from actual recovery, although the buds may not have been invaded or the virus concentration may have been insufficient to induce symptoms. The stalk rather than the stool was the physiological unit involved in distributing and moving the virus in the plant. Removing the infected primary shoot from a stool with initially healthy secondary shoots caused a marked increase in the number of diseased secondary shoots. The appearance of the disease in the secondary shoots may have been correlated with the movement of reserve materials into them from the underground stem portion of the infected primary shoot.

Movement of mosaic virus through sugar-cane seed pieces, I. L. FORBES and P. J. MILLS. (La. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 9, pp. 705-709, illus. 1).—Sugarcane is propagated vegetatively by planting whole stalks or portions of stalks. Usually a number of shoots develop from each seed piece. It was found from inoculation tests, that the mosaic virus can spread from an infected shoot through the old seed piece to other shoots, moving through the seed piece in either direction. The virus can also pass a node and infect other shoots further removed from the point of infection.

Phoma terrestris on sugar-cane roots in Louisiana, F. CARVAJAL (*Phytopathology*, 35 (1945), No. 9, p. 744).—*P. terrestris* was repeatedly isolated during 1942-44 from roots of a number of cane varieties from different Louisiana localities. The fungus was also isolated from onion, garlic, sweetclover, and corn roots, as well as from cane, rice, and cotton soils. The pycnidial stage readily developed from all isolates on potato-dextrose agar at room temperature under subdued daylight. In moist chambers under sterile laboratory conditions, most of the isolates penetrated and invaded the tips of the corn roots.

The relation between *Vermicularia graminicola* West. reported on sugarcane and *Physalospora tucumanensis* Speg., F. CARVAJAL (*Mycologia*, 37 (1945), No. 5, pp. 637-638).

A graft-transmissible virus of sweet potato, S. P. DOOLITTLE and L. L. HARTER. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 9, pp. 695-704, illus. 2).—This disease—causing an unusual type of feathery yellow mottling—was observed at one Maryland locality; it does not appear to be common in the field. Infected plants are considerably dwarfed, but there is no pronounced distortion of the leaves and no necrosis of stems, leaves, or roots. The virus was transmitted by approach grafting of diseased to healthy stems and by inserting cylindrical plugs of diseased root tissue into healthy roots. No transmission was secured by other methods of artificial inoculation, and no insect vector is known. The symptoms differ distinctly from those of sweetpotato mosaics, whose transmission has been studied by earlier workers; it is proposed that the disease be known as feathery mottle of sweetpotato. Under the system of generic classification proposed by H. H. McKinney it is suggested that it be listed as *Flavimacula ipomeae* n. sp.

Chilling injury of cured and noncured Porto Rico sweetpotatoes, J. M. LUTZ (U. S. Dept. Agr. Cir. 729 (1945), pp. 8, illus. 2).—Lowering of the quality of freshly harvested noncured Porto Rico sweetpotatoes under constant temperatures was evident after they had been held 2 days at 32°, 4 days at 40°, or 10 to 21 days at 50° F. Decay during storage was increased in the noncured roots by holding periods of 4 to 10 days at 32°-50°. Curing or a delay of 30 days or more between harvesting and subjecting the roots to low temperatures prevented some of the damage from chilling at 32° and 40° and prevented most of it at 50°. Constant temperatures of 50°-60° resulted in increased decay in noncured roots as compared to those stored in a fluctuating temperature such as prevails in a sweetpotato storage

house. Cured sweetpotatoes were not affected in this manner by these constant temperatures. In those stored in a sweetpotato storage house, a minimum temperature of 50° was as satisfactory as one of 55°.

A biochemical study of soil organic matter as related to brown root rot of tobacco, E. D. MATTHEWS. (Md. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 7, pp. 315-325).—In this study a number of soils from tobacco rotation plots at Upper Marlboro, Md., were investigated; the amount of organic matter in each was determined, as well as the following constituents of the organic matter: The benzene-alcohol soluble fraction, the carbohydrate material, organic N complexes as calculated from amide, nonamide acid-hydrolyzed N, hydrolysis-resistant N, and lignin-humus. The total soil N and its biochemical distribution were determined, the fractions investigated being nitrate N, water-soluble N other than nitrate, ammonia N, amide N, nonamide acid-hydrolyzed N, and resistant or nonhydrolyzed N. The severity of brown root rot—attributed by the author to *Rhizoctonia bataticola*—was estimated by direct examination of the roots and a root rot index established. The laboratory results were analyzed statistically in conjunction with the root rot indexes to determine what organic constituents of the soil or what fractions of soil N might be associated with the severity of attack.

Nitrate N was the only single soil constituent found very significant in its influence on severity. The coefficient of correlation between nitrate N, as parts per million of the soil, and the severity of the disease was shown to be -0.292 ± 0.096 ; when nitrate N is expressed as percent of total N, this coefficient is -0.273 ± 0.097 . The carbohydrate fraction alone was not significant, but the correlation between brown root rot and the carbohydrate : nitrate N ratio was the most significant encountered, being $+0.479 \pm 0.081$. Partial correlations indicated that the influence of variations in nitrate N on severity depended very largely on the influence of variations in the carbohydrate : nitrate N ratio. The severity of brown root rot is thus associated negatively with the nitrate N contents and positively with the carbohydrate-nitrate N ratio of the soil. The preceding crop affects the succeeding tobacco crop indirectly by its influence on the carbohydrate : nitrate N ratio, and more directly by its effect on the nitrate N content of the soil.

A survey of the diseases of the carrot seed crop in Idaho, with control recommendations, G. KENKNIGHT and E. C. BLODGETT (*Idaho Sta. Bul.* 262 (1945), pp. 23, illus. 20).—Information is presented on diseases and their control, including blights, root diseases, diseases due to viruses, and miscellaneous troubles.

Control of lettuce damping-off, D. E. ELLIS and F. A. TODD (*North Carolina Sta. Spec. Cir.* 4 (1945), pp. 7, illus. 3).—An informatory circular on the damping-off of lettuce caused mainly in North Carolina by *Rhizoctonia*, sometimes by *Pythium*, and occasionally by *Sclerotinia*.

The susceptibility of lettuce to mosaic virus in relation to nitrogen, phosphate, and water supply, I. W. SELMAN (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 28-33, illus. 6).—The susceptibility of lettuce to mechanical inoculation with lettuce mosaic virus was studied in the Cheshunt Early Giant variety growing in a mixture of peat and sand with all combinations of three levels of N, three of phosphate, and two of watering. Plants with high N and medium phosphate applications were 100 percent susceptible; those receiving low N, low phosphate, and medium watering were most resistant—12.5 percent infection. Healthy lettuce grown at the levels of the mosaic-resistant group did not differ significantly in fresh weight from plants receiving higher levels of nutrients at the same water level; since the plants were not grown to maturity, no practical conclusion could be drawn. A significant N-water interaction for susceptibility suggested that the available N content of the soil may be an important factor in determining susceptibility. Infection with lettuce mosaic virus at the four to six leaf stage resulted in 68 percent reduction in fresh weight relative to healthy controls.

Lima bean diseases in California, W. C. SNYDER and J. T. MIDDLETON. (Univ. Calif.). (*Seed World*, 58 (1945), No. 1, pp. 58, 60, 62).—This reports the results of a survey of diseases of lima beans grown in the State for dry beans and for seed during the normal summer dry season. Foliage and pod diseases were absent; occasional evidence of heat blast of the top set of pods, of *Rhizoctonia* infection of pods under certain circumstances, of physiological reddening or burning of the foliage, and of a trace of powdery mildew constituted the only leaf or pod troubles observed, except for a possible case of "yeast spot." From this survey, as well as from observations in other years, it is concluded that seed grown in California during the normal summer season carry no bacterial pathogens (none observed in any instance) and likewise, for the same reason, that such seed can be depended upon to be free of the other seed-borne diseases listed, viz, pod blight, downy mildew, scab, stem anthracnose, and virus diseases.

Alternaria blight versus the genus *Lycopersicon*, R. W. BARRATT and M. C. RICHARDS (*New Hampshire Sta. Tech. Bul.* 82 (1944), pp. 25, illus. 11).—Considerable research and testing of many tomato varieties revealed none to be available for breeding stock which was immune or resistant to *A. solani* under favorable conditions for infection. Differences in defoliation among varieties, however, have been observed by many workers. A study of 27 varieties, 33 selections from crosses, and 13 tomato introductions indicated that under the same field conditions certain lines exhibit less defoliation than others. Relationships were found between defoliation and the period of yield and the fruit load of a plant as measured by fruit-to-leaf quotient; weather was also shown to affect defoliation by influencing both the plant and the pathogen. These factors are interrelated in that they all to some degree affect the rate of physiological maturity of the plant. The crossing of *Lycopersicons* with species of closely related genera is suggested as offering a possibility of securing resistance or immunity to *A. solani*. Good yields may be obtained by planting varieties with high leaf-to-fruit ratio in areas where medium to late tomatoes can be grown. Large differences in marketable yield in determinate varieties were obtained by applying fungicides; 75 percent control of defoliation proved satisfactory in maintaining yields. Addition of nitrogenous fertilizers at the time of setting in the field and the removal of all blooms after the fourth hand on determinate lines offer possibilities for reducing losses. The interplanting of an early and a late variety—or several plantings of an early variety—is suggested for securing production over the entire fruiting season. There are 20 references.

Big bud disease of the tomato, R. SAHAI VASUDEVA and T. B. LAL (*Indian Jour. Agr. Sci.*, 14 (1944), No. 2, pp. 160-162, illus. 6).—Big bud due to *Lycopersicum virus 5* is reported from India—where it has been studied for several years—and the symptoms are described. The disease was transmitted by grafting, but inoculations by mechanical means were unsuccessful.

Conversion of non-precipitating and inhibiting protein complexes into forms again precipitable by the antisera to the original proteins, A. KLECZKOWSKI (*Brit. Jour. Expt. Pathol.*, 26 (1945), No. 1, pp. 33-41).—When tomato bushy stunt virus was heated with serum albumin, the virus combined with the albumin to form a complex failing to precipitate with antiserum to virus. The virus-resistant to peptic proteolysis—can be recovered in the precipitable form by peptic hydrolysis of this complex. Nonprecipitating complexes similarly formed between human and horse serum albumin can—under suitable conditions—be split by pepsin into forms again precipitable specifically by antisera, although both components of the complex are susceptible to peptic proteolysis.

Virus infection and water loss in tomato foliage, I. W. SELMAN (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 146-154, illus. 5).—Changes in rates of water loss from twin tomato leaflets inoculated with the sap of healthy and virus-infected

leaves were studied during the incubation period, using the cobalt chloride paper method. In leaflets inoculated with spotted wilt, tobacco mosaic, and tomato yellow mosaic viruses, a marked increase in transpiration occurred 1 to 3 days after inoculation. Transpiration methods are suggested for use in the rapid detection of the presence of a virus at seasons when symptom appearance on indicator plants may be long delayed. Inoculation of the upper leaf surface led to increased transpiration from both upper and lower surfaces. The effect of the virus appeared to be primarily on the cuticular transpiration. Leaves at various developmental stages may react differently to virus inoculation; older leaves tend to show the greatest increase in rate of water loss.

Perennial canker of apple trees in England. E. H. WILKINSON (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 180-185, illus. 3).—*Gleosporeum perennans*—not previously recorded in England—was found in three orchards causing canker and dieback of apple branches following summer pruning; it was also isolated from lenticel rots of apples grown in six counties, showing it to be fairly widely distributed. The disease on the branches and fruit is described. It is suggested that the fruit rot be included under the name "bitter rot," one which already covers the fruit rots due to *G. album* and *G. fructigenum*. Growth of spontaneous and induced cankers usually continues for one season only and is then arrested by a callus layer; extension of the fungus beyond this layer was observed only after mechanical injury or attack by woolly aphids. Numerous dieback lesions on 1- to 3-year-old branches showed annual extensions behind the callus ring, and *G. perennans* was found to remain viable in the invaded tissue for several years. Inoculations indicated the fungus to be capable of penetrating bark only through injuries; in apples it can cause rot through lenticels as well as through skin wounds. Pruning tests showed that infection occurs through summer but not through winter cuts. One serious outbreak of the canker in England was surmounted by changing to winter pruning.

An appraisal of spray materials for the control of apple scab in Ontario. G. C. CHAMBERLAIN (*Sci. Agr.*, 25 (1945), No. 11, pp. 680-689, illus. 3).—These experiments "demonstrate conclusively that lime-sulfur 1-40 or 1-60 strength is the most effective fungicide for controlling scab, but cannot be considered 'safe' under Niagara Peninsula conditions," though its use as an eradicant of severe outbreaks might be warranted. If lime-sulfur is used, the 1-60 formula is recommended and 1-80 when combined with wettable sulfurs for prebloom and calyx applications; for the postbloom spray a wettable sulfur is preferred. The milder elemental or wettable sulfurs have the merit of safety and appear to have limited value in seasons favorable to early prebloom infection. Flotation sulfur—dry or paste—and micronized sulfur proved the most effective and reliable substitutes for lime-sulfur. Wettable sulfurs tend to adhere rather poorly; addition of the spreader-adhesive Orthex improved the coverage and adhesiveness, which is particularly valuable under wet conditions at the prebloom and calyx sprays. The special modification of the Ontario spray calendar for orchards heavily infested with codling moth employed copper in place of sulfur for the first and second cover sprays and proved very effective in preventing fruit infection; from the standpoints of color and finish, however, it was inferior to the regular sulfur schedules. The use of Fermate is briefly reviewed.

New fungicides and apple scab control. R. H. DAINES. (N. J. Expt. Stas.). (*Md. State Hort. Soc. Proc.*, 47 (1945), pp. 1-3).—Among the new fungicides tried, Fermate alone was tested sufficiently to be recommended for general use, though Isothan Q15 and Puratized N5-X have, during 2 years' experimentation, given encouraging results.

Results of some tests with Fermate, a promising new fungicide. H. G. SWARTWOUT. (Mo. Expt. Sta.). (*Nebr. State Bd. Agr. Ann. Rpt.*, 1944, pp. 312-

318).—A brief summary of results in 1943 on apples, sour cherries, and miscellaneous fruits, with suggestions for use from 3 years' tests with arsenical safeners.

Fungicides in relation to scab and fruit russet of pear in the Hood River Valley, Oregon, J. R. KIENHOLZ and L. CHILDS. (Oreg. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 35 (1945), No. 9, pp. 714-722).—The disadvantages of wettable sulfur sprays for controlling *Venturia pyrina* infection on spray-sensitive pear varieties in Oregon are discussed. Comparative tests with other fungicides on Anjou pears are reported, and the injurious and ineffective materials are listed. Leaves remained lighter colored throughout the season on trees sprayed with wettable sulfur, and the fruit set was probably reduced; sulfur fungicides appear to be directly toxic to this variety. Copper phosphate mixture gave adequate scab control and russet-free fruit during average seasons, but failed in control and produced fruit injury during wet seasons. Fermate was the most promising substitute tested for use on spray-sensitive pear varieties. Proper timing and thorough applications of fungicides for efficient scab control are again emphasized.

The control of bacterial canker and leaf-spot in sweet cherry, H. B. S. MONTGOMERY and M. H. MOORE (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 155-163, illus. 1).—Bacterial canker (*Pseudomonas mors-prunorum*) was well controlled over four seasons on the susceptible Bigarreau de Schrecken cherry by spraying with bordeaux both in fall (10-15-100) and spring (6-9-100 preblossom). Each spraying separately contributed partial control, while spring sprays—especially at petal fall—controlled moderate leaf spot. Foliage damage followed use of this spray stronger than 4-6-100 postblossoms, but addition of edible cottonseed oil (0.75 percent by volume) prevented this effect in the one season tried. Disease incidence on this variety was influenced by rootstock and by seasonal conditions; that of spray damage on Napoleon, Rivers, and Frogmore, by rootstock.

Leaf curl and pockets control by a lime-sulphur dormant spray, W. F. BUCHHOLTZ and C. M. NAGEL (*South Dakota Sta. Bul.* 380 (1945), pp. 8, illus. 2).—A single dormant spray was found to control leaf curl and pockets of sand cherries and plums in South Dakota, lime-sulfur (31°-33° B.) 1-9 being suitable; it may be applied after leaf fall or in spring by April 1. The fungus (*Taphrina communis*) overwinters only as spores, some of which are lodged on the overwintering buds. Fall sprays were successful in 1942-44; spring sprays were highly successful in 1943 and 1944 and partially so in 1942. Combination of fall and spring sprays seemed slightly superior to either one alone but are probably not justified. The fungus was spread readily in 1943 from relatively few infections in the experimental block; such spread indicates the necessity for spraying every year.

Studies on cranberry false blossom, L. O. KUNKEL (*Phytopathology*, 35 (1945), No. 10 pp. 805-821, illus. 3).—The virus was transmitted by dodder (*Cuscuta campestris*) from cranberry to 28 plant species in 10 families. It was transmitted by dodder from *Vinca rosea* and tomato to cranberry plants. It was retained by dodder growing on healthy plants over a period of 2 yr. and apparently multiplies in this vector. The virus was also transmitted by grafting to *V. rosea*, Turkish tobacco, tomato, potato, *Nicotiana glutinosa*, and *N. rustica*, but was not transferred mechanically via plant juice, *Macrosteles divisus*, or through dodder seeds produced by this parasite while growing on a diseased tomato plant. In all the species to which it was taken false blossom produced the yellows type of symptoms. In many it caused gigantism in flowering and fruiting organs; in the tomato, it caused sterility. In periwinkle and cranberry the disease was cured by heat treatments, 42° or 43° C. for about 8 days being recommended for cranberry. It is suggested that false blossom may be closely related to big bud of tomato in Australia and the United States, to stolbur of tomato in the U. S. S. R., and to little leaf of eggplant in South India. There are 26 references.

Control of gooseberry diseases, R. F. SUTT and D. H. PALMITER (*New York State Sta. Bul.* 711 (1945), pp. 22, illus. 7).—The three major diseases of gooseberries in New York State are powdery mildew (*Sphaerotheca mors-uae*), leaf spots (*Mycosphaerella grossulariae* and *Pseudopeziza ribis*), and rust (*Puccinia grossulariae*). Powdery mildew and leaf spot are generally prevalent throughout the State; rust occurs in the Hudson Valley region. Control experiments were conducted during 1937–44, inclusive. In the spray tests reported, only one application immediately after bloom of 2–100 lime-sulfur plus 0.5 lb. Spraysoy A gave effective control of powdery mildew. In most years, copper fungicides were also satisfactory but were not effective during a dry season. Two applications of 3–5–100 bordeaux plus 1 pt. of S. E. C. oil, the first made 2 or 3 weeks after bloom and the second after harvest, gave superior control of leaf spot. Of the 11 insoluble coppers tested, Yellow Cuprocide plus lime at 1–4–100 with 1 pt. of S. E. C oil was best but not as good as bordeaux. Copper injury to gooseberry foliage occurred but was prevented by use of a 3–5–100 bordeaux or addition of 1 lb. of lime for each 0.25 lb. of actual Cu in the insoluble copper fungicides. Rust was controlled by eradicating or burning over the sedge areas adjacent to gooseberry plantings or by spraying. Spray tests showed that for effective control of rust, three applications of 2–100 lime-sulfur were required, the first to be made at the green-tip stage, the second about 10 days later, and the third just before bloom.

Protein precipitation and virus inactivation by extracts of strawberry plants, F. C. BAWDEN and A. KLECZKOWSKI (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1–4, pp. 2–7).—Specific antisera could not be produced against extracts of virus-infected strawberry plants, possibly because of properties of the host. No soluble protein could be extracted from the fruit, leaves, runners, or roots; the aqueous extracts from all organs reduced the infectivity of tobacco mosaic virus. Except those from the fruit, all extracts contained much tannin and they precipitated serum proteins. The possible effect of this on failure to transmit strawberry viruses mechanically is discussed.

Rhizoctonia bud rot of strawberry plants, J. B. DEMAREE. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 9, pp. 710–713, illus. 1).—A bud rot of strawberries caused by a *Rhizoctonia solani*-type fungus and observed in Arkansas, Delaware, Maryland, Mississippi, North Carolina, and Tennessee is described. The pathogen kills both leaf and flower buds during early spring soon after growth has started. Later on, several adventitious leaf buds form, resulting in "multiple crown" plants that bear no fruit that year. Bud rot is usually of minor importance, but occasionally fields have been observed where 25 to 30 percent of the plants were infected. The *Rhizoctonia* isolated from field-infected plants proved pathogenic to potted strawberry plants in the greenhouse. The early symptoms of the disease are very similar to and can easily be mistaken in the field for injuries by the sucking insect *Orthea vincta* in Florida, the crown rot disease due to *Sclerotinia sclerotiorum* in southern Louisiana, and spring dwarf caused by the nematode *Aphelenchoides fragariae*.

Chemical treatment for scaly bark of citrus, H. S. FAWCETT. (Calif. Citrus Expt Sta.). (*Calif. Citrog.*, 30 (1945), No. 11, p. 340, illus. 1).—The method—consisting of applications to the bark of a 1 percent solution of DN-75 (dinitro-*o*-cyclohexylphenol in kerosene)—is the result of experiments over a period of years; it is offered as an easier and cheaper substitute for the standard bark-scraping method rather than as a cure-all.

New scaly-bark treatment, H. S. FAWCETT. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 25 (1945), No. 9, p. 9).—See preceding entry.

Report on a Statewide survey for quick decline of orange trees in California, G. L. STOUT (*Calif. Dept. Agr. Bul.*, 34 (1945), No. 3, pp. 108–115).—A

typical quick decline picture was presented in three highly concentrated areas—two in Los Angeles County and one in Orange County. A less concentrated area occurs in western San Bernardino County, and scattered cases were found in other outlying areas. It is hoped—and there is reason to believe—that these outlying cases will eventually turn out to be other than true quick decline, but in these three highly concentrated areas there is said to be a definite quick decline development. As a whole, the picture was one which might be expected in a spreading disease; it is noteworthy that as the survey progressed to a distance from the concentrated areas, the disease ran out and in a large part of the orange area of the State not even suspected trees were encountered. Through efforts of the local county agricultural commissioners, some of the outlying tree cases in the four counties named have been removed as a precautionary measure.

A nectria disease of coffee in western Guatemala, D. G. HEISER (*Ann. Missouri Bot. Gard.*, 32 (1945), No. 3, pp. 287–296, illus. 8).—Although this canker disease of *Coffea* is believed to have existed in Guatemala over a decade ago, little importance has been attached to it since only an occasional tree died; in 1936 in the Depto. de San Marcos, however, it assumed alarming proportions. This study concerns the fungus, here described as *Nectria dodgei* n. sp. and compared with other Nectrias (with key) reported on *Coffea*. The symptoms of the disease on the trunk, roots, leaves, twigs, and fruit and the culture characters of the fungus are described. Isolations from the *Nectria* ascospores produced only the imperfect *Fusarium* stage. The one inoculation test made failed to give infection.

Virus diseases of guayule, H. H. P. SEVERIN. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 9, pp. 737–738).—Guayule seedlings were infected with ordinary tobacco mosaic and tobacco ringspot viruses by mechanical inoculation with the carborundum method. The type of infection with the two viruses was local and not systemic. Guayule seedlings proved nonsusceptible to western and ordinary cucumber mosaic, western celery mosaic and celery calico, beet mosaic, sugar beet curly top, and California aster yellows viruses.

Periconia blight of Hevea, J. A. STEVENSON and E. P. IMLE. (U. S. D. A.). (*Mycologia*, 37 (1945), No. 5, pp. 576–581, illus. 4).—This leaf spotting and blight was found on four species of *Hevea* and on hybrids of *H. brasiliensis* × *H. spruceana*. It is said to be very destructive to *H. spruceana* during prolonged rainy weather, but all evidence at hand indicates that it will not become a problem on the important rubber-producing species of commerce, *H. brasiliensis*, except where this is grown in mixture with the highly susceptible species. The causal fungus is described as *P. heveae* n. sp.

Rhizoctonia foliage disease of *Hevea brasiliensis*, J. E. KOTILA. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 9, pp. 739–741, illus. 1).—A *Rhizoctonia* was isolated from affected leaves of *H. brasiliensis* collected in Tingo Maria, Peru; these leaves had spots 1 to 10 mm. or more in diameter surrounded by a narrow brown border and blighted areas involving a half to two-thirds of the leaf. Brown-tinted *Rhizoctonia*-like mycelium, 6.5μ in diameter, and the perfect stage of the fungus were found on the surface of the affected leaves; rhizomorphs were absent. When young leaves of greenhouse-grown rubber plant seedlings kept under 21°–25° C. and 95–100 percent relative humidity were inoculated with the isolate, infection occurred in 5 days and the perfect stage appeared 5 days later. Infection and formation of the perfect stage on sugar beet leaves, under similar conditions, occurred in 10 to 15 days. The perfect stage appears as grayish-white powdery areas, composed of closely intertwined dichotomously branched hyphae tightly adherent to the leaf surface. The basidiospores—usually four per basidium—averaged 8.2μ × 3.7μ. This and other characters conformed with those of *Pellicularia filamentosa*.

Brown-canker control, L. M. MASSEY. (Cornell Univ.). (*Amer. Rose Ann.*, 1945, pp. 147-150, illus. 7).—A brief account is given of brown canker of rose (*Cryptosporella umbrina*), and a schedule for control of this disease and stem canker (*Coniothyrium fuckelii*) is presented.

Fermate tests, L. M. MASSEY. (Cornell Univ.). (*Amer. Rose Mag.*, [6] (1945), No. 5, pp. 142-145, illus. 1).—Cooperative tests of Fermate dust and spray programs against rose diseases were conducted by 28 gardeners, who reported detailed results for analyses; this paper briefly summarizes the findings. The fact that all but 3 of the cooperators want to try Fermate again would indicate that it is not without promise. It appeared superior for rust control, another effective and perhaps superior fungicide against black spot, one that can be combined with other materials for mildew and insect control, and one that is less injurious to the rose than most fungicides; it is also not seriously objectionable as to discoloration. The 1944 results clearly justify further trials.

Factors affecting the saprogenic activities of the Dutch elm disease pathogen, L. J. TYLER and K. G. PARKER. (Cornell Univ.). (*Phytopathology*, 35 (1945), No. 9, pp. 675-687, illus. 2).—The optimum temperature for coremium spore germination in two culture races of *Ceratostomella ulmi* was about 27° C.; at 18° and lower the spores tended to bud. Other factors such as racial differences, age of spores, and nutrition also influenced spore germination. The temperature range generally favorable to mycelial growth on potato-dextrose agar was 21° to 30°. For the races studied, the minimum for growth was between 1° and about 3°, the optimum about 27°, and the maximum between 33° and 36°. The optimum temperature for development of coremia was about 24°. Some culture races formed coremia on elm wood at 3° to 30°, others did not form them below 9°, while two races failed to produce coremia at any temperature tried. The coremium spores germinated well on glass microslides and on elm wood at relative humidities of 98 percent or higher but not at 96 percent or lower. When vitally established in the form of mycelium and spores in diseased elm wood the organism grew out over the surface at relative air humidities of 92 percent or above; growth was very sparse at 92, fair at 96, and abundant at 98 and 100 percent relative humidity. The fungus lived at least 2 yr. in diseased elm wood protected from rapid loss of water and from abnormally high temperatures. Conditions inducing or permitting rapid water loss from diseased wood proved generally unfavorable for survival of the pathogen in such material.

Wetwood of elms, J. C. CARTER (*Ill. Nat. Hist. Survey Bul.*, 23 (1945), Art. 4, pp. 407-448+, illus. 31).—This investigation was the outgrowth of studies of an unusual wilt observed on a large number of American elms in Hinsdale, Ill., during July-August, 1939. During 1939-43, 284 trees wilted because of wetwood infections in their trunks; none of them which wilted died, and only 73 wilted in more than 1 yr. This infection has been found in the American elm and its varieties Moline and Littleford, the slippery elm, and the English and Siberian elms. Samples from 346 elms in 21 Illinois counties were cultured; the wetwood bacterium—here described as *Erwinia nimipressuralis* n. sp.—was isolated from 239 of them and 292 showed wilt at the time the samples were taken. The organism inhabits principally the vessels and ray cells of the trunk, but does not grow in sufficient abundance to cause general clogging of the conducting tissues and does not cause disintegration of the tissues it inhabits. Wetwood and flux were produced by trunk-wood inoculations—but not wilt, nor was wilt induced by inoculated buds, leaves, shoots, or branches or by patch grafting with discolored inner bark from diseased trees. Sap from wetwood caused young trees to wilt after introduction into their current-season wood. Apparently the grayish brown streaks in current-season wood are caused by the discolored sap and not by the wetwood bacterium, which was not often isolated from wilting branches.

Trunk pressures in wetwood-infected elms commonly reached 5 to 30 lb. per square inch and were highest in trees that did not flux. A pressure of 60 lb. was recorded in one tree. Pressures began to develop in April and early May, increased until August or September, and then decreased until late December or January; they were not detected in February-March. In artificially infected greenhouse trees, pressures followed a diurnal cycle with a maximum between 11 a. m. and 1 p. m. and a minimum between 7 and 11 p. m. Gas from affected elms contained methane, CO₂, O₂, H₂, and N₂; the sap contained K and phosphate. Determinations of pH showed the sap and discolored wood of wetwood trees to be alkaline; that of healthy trees, acid. Control measures tested included feeding with 10-8-6 fertilizer and urea, installation of drains in the trunks, and injection of HgCl₂, CuSO₄, AgNO₃, 8-hydroxyquinolin sulfate, and Helione. None of these means appeared to help except the drains, which gave at least temporary control of the flux. There are 41 references.

Strumella canker of oak, B. SLEETH and R. C. LORENZ. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 9, pp. 671-674, illus. 1).—Saplings of *Quercus alba*, *Q. montana*, *Q. borealis maxima*, *Q. coccinea*, and *Q. velutina* were inoculated with *S. coryneoides* isolated from typical strumella cankers on various oaks. Inoculations were made in the fall, and the fungus was reisolated the following spring; by the third year typical strumella cankers had started to develop. The fungus showed no host preference, cross inoculations being as readily made as within the same species. All control inoculations with sterile rice gave negative results.

White pine blister rust control in California and Oregon, W. V. BENEDICT and T. H. HARRIS (U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1945, pp. 18+, illus. 11).—This is a summary of control work in California and Oregon, States distinguished by having within their borders the entire range of sugar pine, 2.5 million acres of which have been included in blister rust-control areas. Through the Lea Act (text given) the Federal Government has provided enabling legislation for control of this disease on lands in public and private ownership; this legislation has been implemented by the appropriation of funds to be handled through the U. S. Department of Agriculture. At the end of the 1944 season, initial *Ribes* eradication in the two States was 37 percent and the total job 22 percent completed. "If severe white pine losses are to be averted, the remaining initial eradication and reeradication of *Ribes* on lands in all ownerships should be completed as soon as possible. In northern Idaho some of the unprotected white pine stands are ruined by blister rust. . . . The same situation is sure to develop in southern Oregon and California unless prompt protection is given to the even more susceptible sugar pine stands." Facts about the disease, a statement of the problem, organization of the control work, and its present status are presented in some detail. Maps indicate the control units and blister rust infections in the two States and the range of white pines and blister rust in the United States. The disease, its manner of spread, and the methods of control are illustrated.

Nuevas observaciones sobre la cancrrosis de los álamos [New observations on septoria spot of poplars], A. A. SARASOLA (*Rev. Argentina Agron.*, 12 (1945), No. 2, pp. 115-119, illus. 1; Eng. abs., pp. 118-119).—The geographic range of *Septoria musiva* in Buenos Aires Province is extended, and information on its economic importance is given. Lombardy poplar was found very resistant under natural conditions. Moisture and soil conditions appeared to influence the attacks on some of the poplars. The author also found the perfect stage, *Mycosphaerella populorum* in Argentina. Notable differences in the measurements of the fungus according to hosts are considered; the leaf spots on the same host also differed according to the season. These data suggest the possibility that some species of *Septoria* and *Mycosphaerella* described on members of the genus *Populus* and based on such characters may be identical.

Danger of decay in poorly seasoned lumber, R. R. HURT and J. L. LOWE (*Jour. Forestry*, 43 (1945), No. 10, pp. 717-718).—The authors present two cases where poorly seasoned lumber in house construction led to serious decay; they warn against continued use of such material.

Studies in the biology of wood-rotting fungi of Bengal, S. BANERJEE and B. K. BAKSHI (*Jour. Indian Bot. Soc.* 24 (1945), No. 2, pp. 73-93, illus. 32).—The six Polyporaceae studied include *Polyporus brumalis*, *P. friabilis*, *P. rubidus*, *P. ochroleucus*, *Polystictus steinheilianus*, and *Merulius similis*. The technic for making different types of cultures and preparing media and the conditions under which the fungi were grown are described. Descriptions of the fungi, including their geographical distribution, occurrence, habit, color, growth rate, mycelium in culture, and sporophore production on various media are given, and general observations are presented on the effects of light, temperature, substrate, humidity, and aeration on their vegetative growth and fruit body formation.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Rat control on Hawaiian sugar cane plantations, R. E. DORY (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 49 (1945), No. 2, pp. 71-239, illus. 73; also *Hawaii. Sugar Planters' Sta., Agr. and Chem. Bul.* 55 (1945), pp. 71-239+, illus. 74).—This monograph aims to bring together present knowledge (87 references) on the field control of rats in sugarcane fields; the four species found in Hawaii are discussed, including some of their food and nesting habits, the nature and extent of their injury to cane, and the more important diseases which they spread. The control value of the mongoose is featured in contrast to adverse criticism sometimes heard. Study of rat populations in or near Hawaiian canefields revealed some of the factors controlling migration and distribution. Poisoning, when properly carried out, is shown to be the only practical and economical plan of control for large field areas. The development of rat-control work in Hawaii is traced from its beginning in 1918, showing the successive roles of barium carbonate, strychnine, thallium sulfate, and zinc phosphide. Use of dry cereal baits is traced from its early use in direct poisoning in the form of torpedoes to the present pre-baited method of feeding loose grain in feeding-station pans. The benefits from oil attractants, sugar, and coloring agents in identifying poisoned baits are discussed. Both the theory and field procedure in prebaiting work are reviewed in detail, with some suggested modifications in technic. Many questions pertaining to rat control have been subjected to cage and field tests, prebaiting being proved more efficient than direct poisoning. The problem of reinfestation of treated areas and the acceptance v. detection of poisoned bait also receive attention. The comparative efficiency of several rat poisons was studied by the prebaited feeding-station method. Zinc phosphide proved equal to thallium sulfate in efficiency; yellow phosphorus was second in effectiveness, while forms of red squill, strychnine, and arsenic were distinctly inferior. The danger of poisoning other animals by thallium sulfate is contrasted with the absence of this danger to pet animals from eating rats poisoned by the zinc phosphide bait. Precautions for handling poisons are enumerated, and a list of poisoned-bait formulas is presented in an appendix.

Seasonal food choices of the fox squirrel in western Kansas, R. E. BUGBEE and A. RIEGEL (*Kans. Acad. Sci. Trans.*, 48 (1945), No. 2, pp. 199-203, illus. 4).—Lists of foods of *Sciurus niger rufiventris*—with brief notes on their utilization—are presented for late summer and fall, summer, and winter and spring.

The concept of the biome as applied to the distribution of North American birds, E. P. ODUM. (Univ. Ga.). (*Wilson Bul.*, 57 (1945), No. 3, pp. 191-201).—In this introductory paper of the symposium on bird distribution and ecological

concepts the author attempts to clarify and simplify rather than elaborate, presenting first a simple comparison of the life zone and biome theories and second a discussion of the theoretical and practical aspects of the biome concept as applied to the distribution of birds during the breeding season in North America; this material is presented in semioutline form. There are 29 references.

A list of arthropods, arranged according to order, family, and genus, and their susceptibility to rotenone and the rotenoids, R. C. ROARK (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1945, E-656, pp. 27).

The internal morphology of the common red spider mite (*Tetranychus telarius* Linn.), W. E. BLAUVELT [*New York*] *Cornell Sta. Mem.* 270 (1945), pp. 35, illus. 51).—This publication resulted from extensive and intensive studies of common red spider mites sectioned at 2μ - 5μ and stained with Heidenheim's iron haematoxylin. Observations were also made of living specimens placed in various media. Information is included on synonymy, integument, mouthparts, digestive system, respiratory system, central nervous system, musculature, silk glands and other salivary glands, fat body, and female and male reproductive organs. A brief literature review is given on each of these points. The important literature references are cited, and 51 figures help clarify the descriptive morphological material.

A new genus, new species of dermanyssid mite (Acarina) from Texas, G. F. AUGUSTSON (*Bul. South. Calif. Acad. Sci.*, 44 (1945), No. 2, pp. 46-48, illus. 5).—*Chiroptonyssus texensis* n. gen. and sp. are described.

The nematode genus *Abbreviata* (Travassos, 1920) Schulz, 1927, B. B. MORGAN. (Univ. Wis.). (*Amer. Midland Nat.*, 34 (1945), No. 2, pp. 485-490).—Includes a parasite-host list and a bibliography of about two pages.

[Notes on insects and insecticides] (*Jour. Econ. Ent.*, 38 (1945), Nos. 3, pp. 290, 364, 389-411, illus. 4; 4, pp. 491-501, illus. 2).—Contributions presented (E. S. R., 93, p. 739) are in No. 3 Cupriferous Cement as a Roach Repellent (p. 290); Vegetable Weevil in Oklahoma (p. 364); Sabadilla Dust to Control the Squash Bug, by R. J. Dicke, E. J. Dexheimer, and T. C. Allen (p. 389), Reduction of Certain Insects Infesting Alfalfa by Use of Sabadilla, by T. C. Allen, F. J. Dexheimer, and E. Cole (pp. 389-390), Effectiveness of Sabadilla in Control of Cabbage Worms, by L. K. Brunn and T. C. Allen (p. 392), and Control of Potato Leafhoppers Infesting String Beans, by E. H. Fisher and T. C. Allen (pp. 392-393) (all Wis. Expt. Sta.); Toxicity of Sabadilla to Chinch Bugs and Squash Bugs, by H. D. Tate and D. B. Gates (p. 391) (Nebr. Sta.); A Microsporidian in *Macrocentrus encylivorus*, by H. W. Allen and M. H. Brunson (p. 393) (U. S. D. A.); Quieting Mosquito Larvae, by J. B. Gerberich (pp. 393-394) (Ohio State Univ.); Mass Production of *Trichogramma* Using Eggs of Potato Tuber Worm, by S. F. Flanders (pp. 394-395) (Calif. Citrus Sta.); Control of Several Scales Infesting Orchids, by E. N. Cory (p. 395); A Calcium Cyanamid-Sodium Fluosilicate Mixture for Use as a Defoliant, by S. Marcovitch (pp. 395-396) (Tenn. Sta.); Gelatin Capsules Used in Studies of Insect Parasites, by W. G. Wellington (p. 396); Infestation of a Red Fox by *Amblyomma americanum*, by R. W. Portman and P. D. Dalke (p. 397) (Univ. Mo. et al.); Fuel Oil as a Larvicide for the Tobacco Flea Beetle, by J. U. Gilmore and C. Levin (pp. 397-398) (U. S. D. A. coop. N. C. Sta. et al.); Christmas Tree Quality Improved by Methyl Bromide Fumigation, by R. Latta (p. 398) (U. S. D. A.); Effect of Cattle Grub Treatment on Weight Gains in Beef Cattle, by H. Gunderson (pp. 398-399) (Iowa State Col.); DDT Fails to Remove Horsebots, by H. S. Telford and P. D. Harwood (p. 399); Cryolite and Some Organic Compounds to Control Corn Earworm and the Mexican Bean Beetle, by L. W. Brannon (p. 400), and A Dispenser for Methyl Bromide and Methyl Bromide-DDT Aerosols, by D. F. Starr, E. W. Baker, and J. A. Ramirez (p. 401) (both U. S. D. A.); New Distribution Records for the Mosquitoes

of the Southeastern States in 1944, by S. J. Carpenter, R. W. Chamberlain, and J. F. Wanamaker (pp. 401-402); Strange Oviposition Habits of a Treehopper, by S. W. Frost (p. 403) (Pa. State Col.); Insecticidal Tests for Control of Green Clover Worm and *Autographa* on Snap Beans, by L. W. Brannon (pp. 403-404) (U. S. D. A. coop. Va. Truck Sta.); Collection Records of *Culex tarsalis* in Army Camps in the Southeastern States During 1942, 1943, and 1944, by S. J. Carpenter (pp. 404-406); Boric Acid as a Stomach Poison for the German Cockroach, by O. S. Bare (p. 407) (Nebr. Sta.); Biology and Control of the Lima Bean Vine Borer, by L. W. Brannon (pp. 407-408) (U. S. D. A. coop. Va. Truck Sta.); Laboratory Rearing of *Aedes atropalpus*, by H. L. Trembley (pp. 408-409); The Use of a "Rototiller" for Application of Soil Fumigants, by H. E. Morrison, D. C. Mote, and R. N. Lumde (p. 409) (Oreg. Sta.); A Synonym of *Cerosiphia subterranea* (Mason), by E. O. Essig (p. 409) (Univ. Calif.); *Orthopodomyia alba* in Kentucky, by J. B. Kitzmiller (p. 409); DDT to Control *Scutigerella immaculata*, by H. E. Morrison, D. C. Mote, and W. B. Rasmussen (p. 410) (Oreg. Sta.); DDT to Control Cabbage Caterpillars, by J. W. Apple (p. 410) (Ill. Nat. Hist. Survey); and DDT Ineffective for Control of an Exotic Earthworm [*Pheretima hupeiensis* Michaelson], by W. E. Fleming and C. H. Hadley (p. 411) (U. S. D. A.).

Contributions presented in No. 4 are Field Tests of the Thunder God Vine [*Tripterygium forrestii*] Against Melon Leaf Beetle [*Rhaphidopalpa chinensis* Wei], by T.-H. Cheng (pp. 491-492); The Toxicity of DDT to Certain Forms of Aquatic Life, by P. M. Eide, C. C. Deonier, and R. W. Burrell (pp. 492-493) (U. S. D. A.); DDT as a Termite Repellent, by G. N. Wolcott (p. 493) (P. R. Univ. Expt. Sta.); Observations on Housefly Overwintering, by J. G. Matthyse (pp. 493-494) (Cornell Univ.); Toxicity of DDT to Subsurface-Feeding Species of Mosquitoes, by J. M. Ginsburg (pp. 494-495) (N. J. Stas.); A Barrier for Confining Crawling Organisms, by S. E. Flanders (p. 495) (Calif. Citrus Sta.); DDT for Control of the Cotton Flea Hopper, by K. P. Ewing and C. R. Parencia, Jr. (pp. 495-496) (U. S. D. A. coop. Tex. Sta.); Atomized Concentrated Sprays Containing DDT To Control Pea Aphid and Clover Leaf Weevil, by S. F. Potts, T. E. Bronson, R. Latta, and F. W. Poos (p. 497); *Anopheles oviventatus*, an Egg-Parasite of *Lygus hesperus*, by V. E. Romney and T. P. Cassidy (pp. 497-498), and *Cyrtopeltis varians* in Some of the Tobacco-Growing Areas of North Carolina, by W. A. Thomas (pp. 498-499) (all U. S. D. A.); The Residual Toxicity of the Pyrethrins to *Anopheles quadrimaculatus*—Preliminary Studies, by R. L. Metcalf and C. E. Wilson (p. 499); Swarming of Collembola in North Carolina, by D. L. Wray (p. 500); Reduced Concentrations of Ethylene Dichloride for Peachtree Borer Control, by C. F. Smith (pp. 500-501) (N. C. Sta.); and Packing Mosquito Larvae for Storage or Shipment, by S. J. Carpenter (p. 501).

Common insect pests of New York, P. J. PARROTT ET AL. (*New York State Sta. Circs.* 159, 160, 163, 169, 171, 172, 176, rev. (1944), pp. 4 each, illus. 1 each).—These revised circulars deal, respectively, with The Striped Cucumber Beetle and The Mexican Bean Beetle, both by H. C. Hockett and G. E. R. Hervey (E. S. R., 74, p. 228); The Spruce Gall Aphids, by F. L. Gambrell, The Codling Moth, by S. W. Harman, The Asparagus Beetle, by H. C. Hockett, and The Peachtree Borer, by D. M. Daniel, E. H. Smith, and E. H. Wheeler (E. S. R., 78, p. 362); and The European Corn Borer, by L. A. Carruth (E. S. R., 89, p. 572).

Transpiration through the cuticle of insects, V. B. WIGGLESWORTH (*Jour. Expt. Biol.*, 21 (1945), No. 3-4, pp. 97-114, illus. 28).—Transpiration through the insect cuticle is restricted by a thin layer of orientated wax on the outer surface of the epicuticle; in at least some species this wax layer is covered by a thin layer of cement. When heated to a certain temperature the wax layer exhibits an abrupt increase in permeability to water; this "critical temperature" varied widely in

different insects and in different stages of the same species, being highest in those most resistant to desiccation. In the newly formed puparium of *Calliphora* the impermeable wax film is wholly superficial, as in other insects. After pupation, however, the main impermeable layer is on the surface of the true pupa; the critical temperature of the pupa is much higher than that of the puparium. Abrasion of the wax layer results in a great increase in transpiration through the cuticle. Inert dusts cause the desiccation of insects by getting between the moving surfaces of the cuticle and abrading the wax layer. Such dusts in stationary contact with the cuticle will not remove the wax by adsorption; hence they are without action on dead or motionless insects. (The cockroach is an exception; here the waterproof layer is a soft grease.) The places where the wax has been abraded can be demonstrated by immersion in ammoniacal silver solution; the phenol-containing epicuticle stains deep brown only where the wax has been removed. Although the epicuticle shows no visible injury from abrasion, the underlying cells react as though they had been wounded and growth processes in the epidermis are affected. Insect larvae from the soil show great but variable evaporation of water; this results from abrasion of the cuticle by soil particles. If the wireworm (*Agriotes*) is allowed to molt out of contact with the soil it has an impermeable cuticle like other insects. After abrasion the living insect secretes more wax through the substance of the cuticle and so restores its impermeability; adsorption of the wax by dusts while it is being secreted interferes with this process of recovery. Lipoid solvents remove the wax layer from the surface and so increase transpiration. A long series of wetting agents and detergents has been tested; they show widely differing effects on the permeability of the cuticle to water. Removal of the wax layer by abrasive dusts or suitable detergents increases the rate of entry of insecticides through the cuticle. There are 42 references.

The cuticular lipoids of insects, J. W. BEAMENT (*Jour. Expt. Biol.*, 21 (1945), No. 3-4, pp. 115-131, illus. 7).—The impermeability of the cuticle was found due to a thin continuous layer of lipid over the epicuticular surface. Transmission of water through unextracted cuticle was more rapid in the direction epicuticle to endocuticle than the reverse; this asymmetry was most marked in the exuviae. The lipid layer is about 0.25 μ thick on most insects investigated and is independent of cuticular thickness; the thickness of wax on a given species is very constant. The pure extracted lipoids are solid waxes, except in the blattids, which have a mobile grease. The waxes show a gradation of physical properties corresponding to their melting points; the hardest are the most water-shedding and are found on the most impermeable insects. The impermeability of insect wax films, deposited on a membrane, depends on the degree of chemical orientation induced in the lowest layer of molecules by the membrane surface. The monolayer at the epicuticular interface is completely orientated and tightly packed; this is the main barrier to water passage. Waxed membranes exhibit a sudden increase in permeability at a critical temperature corresponding to that of the insect from which it was obtained. The waxes undergo a crystalline transition at this temperature; their molecules become mobile and the orientated layer is disorganized. In the presence of water, wax surfaces become more hydrophilic at the transition point; the molecules are permanently orientated in this state. Boiling solvents must be used to extract waxes from the exuviae; the extracts are all soluble in cold chloroform. The vapor of wax solvents destroys the orientation of the wax on the cuticle. Substances having both hydrophilic and hydrophobic properties are present in the high-melting point waxes; they may be residues of natural emulsifiers. Inert dusts increase the transpiration of waxed membranes by adsorbing the lipid only if the membrane exerts but little orientational force; they cannot overcome the orientational bonds of a wax layer deposited on a membrane of insect epicuticle unless adsorption is augmented

by abrasion. Dusts adsorb all but the lowest orientated layer of the grease on the cockroach. Some analysis is presented of the mode of action of emulsifiers and detergents, which increase the permeability of waxed membranes, and of the insect cuticle. Their efficiency depends on their own permeability to water and possibly also on their ability to penetrate the cement layer on the insect, as well as their capacity for emulsifying wax. There are 31 references.

The coverage factor in the application of dusts, N. TURNER. (Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 359-364, illus. 3).—Two probabilities are involved in the field application of dusts, viz, the probability of reaching the insects with any insecticide at all (coverage), and that of killing the insect with the material that hits it (dosage). These factors can be distinguished by properly designed dosage-response tests. The concentration of the toxicant in the dust affects the probability of killing the pest. Of the factors which might affect coverage, concentration of toxicant and amount applied per acre were studied. Concentration affected coverage because variations in amount of diluent influenced the electrostatic charge developed in the process of applying the dust. Amount per acre within the limits used (10-18 lb.) had little or no effect on coverage. In terms of efficiency, small amounts of higher concentration were preferable to large amounts of low concentration. In reducing the amount used per acre, less control was lost if fewer pounds of dust were applied, rather than the same number of pounds of a lower concentration. There are 16 references.

Insecticidal properties of miscellaneous plants, R. HANSBERRY and R. T. CLAUSEN (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 305-307).—The critical shortages of insecticides of plant origin have aroused and revived the interest of entomologists in plants of the Western Hemisphere which might be of value in insect control. The plants examined at Cornell University have been from four sources: Fish-poison plants from Brazil; legumes and other plants from New York State; insecticidal, fish-poison, or medicinal plants from Mexico and Central America; and miscellaneous plants sent in by various collectors. The results are briefly summarized here.

Plants of possible insecticidal value: A review of the literature up to 1941, N. E. McINDOO (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1945, E-661, pp. 286).—This review is based on 437 references.

The relative effectiveness of the principal alkaloids of sabadilla seed, T. C. ALLEN, K. P. LINK, M. IKAWA, and L. K. BRUNN. (Wis. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 293-296, illus. 2).—The principal constituents of sabadilla seed were diluted at various levels with inert dusting material before testing their relative toxicities against the large milkweed bug and the red-legged grasshopper. Cevadine proved the most toxic to these insects; veratrine, veratridine, and the hydrochlorides of veratrine exhibited considerably less toxicity. Cevine and the oil from petroleum ether extractions were nontoxic at the levels tried. Cevadine was toxic at the 50 percent level of kill for milkweed bugs at 1-8,000; against the grasshopper, it was similarly toxic at 1-2,000 and 1-3,000. In kerosene solution against the large milkweed bug cevadine was more toxic than veratridine; at 1-2,000 it gave a 50 percent kill, the corresponding dilution for veratridine being 1-500. The dilution of DDT in kerosene had to be decreased to 1-10 before a 50 percent kill was obtained in these tests.

The principal alkaloids of sabadilla seed and their toxicity to *Musca domestica* L., M. IKAWA, R. J. DICKE, T. C. ALLEN, and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.* 159 (1945), No. 2, pp. 517-524, illus. 1).—The alkaloids of sabadilla (*Schoenocaulon* sp.) are responsible for the toxicity of kerosene extracts of the ground seed to the housefly. By adsorption of the alkaloid mixture on a column of Al_2O_3 , three fractions differing in toxicity were obtained; cevadine and

veratridine were isolated as their crystalline diliturates. Veratridine in kerosene proved highly toxic to the housefly; cevadine exhibited less toxicity. Both, as well as the remaining alkaloid mixtures, gave very rapid and complete knock-downs. Cevine and cevine dibenzoate in kerosene showed no toxicity to the housefly. The oil extracted from the seed possessed knock-down but no killing power.

Increased toxicity of lime-treated sabadilla seed in dust suspensions, T. C. ALLEN and L. K. BRUNN. (Wis. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 291-293).—Tests against the large milkweed bug and the red-legged grasshopper indicated that the activation of sabadilla dusts appreciably increases their toxicity; heat or alkali (sodium carbonate solution or hydrated lime) may be used. Preparation of a concentrate with hydrated lime or use of this material as a diluent in the dust is the easiest and most efficient method of activation. Large dosages of sabadilla obscured the effects of activation.

The new D. D. T. insecticide, B. SMIT (*Farming in So. Africa*, 20 (1945), No. 231, pp. 337-340, 356).—On the basis of the tests reported, the author sums up by saying "that we know very little about DDT as yet, but that it promises to be a very useful insecticide for household insects such as houseflies and bedbugs; that it may do more harm than good if used indiscriminately as an agricultural insecticide in the open; and that it is by no means the 'cure-all' remedy that some people have imagined. We see, therefore, that it is highly necessary to push ahead with our research work on this material as quickly as possible."

The chemical composition of technical DDT, H. L. HALLER, P. D. BARTLETT, N. L. DRAKE, M. S. NEWMAN, S. J. CRISTOL, C. M. EAKER, R. A. HAYS, G. W. KILMER, B. MAGERLEIN, G. P. MUELLER, A. SCHNEIDER, and W. WHEATLEY. (U. S. D. A., Univ. Md., Ohio State Univ., et al.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 9, pp. 1591-1602).—This study involves a report on the composition of several samples of technical DDT and a sample of "byproduct oil" recovered from a process of refinement of crude DDT prepared from "chlorinated alcohol" and chlorobenzene. Technical DDT contained upward of 70 percent of 1-trichloro-2,2-bis-(*p*-chlorophenyl)-ethane (*p,p'*-DDT), the most active insecticidal ingredient. The major impurity was 1-trichloro-2-*o*-chlorophenyl-2-*p*-chlorophenylethane (*o,p'*-DDT). Lesser amounts of 12 other organic impurities were found, the presence of which may be explained on the basis of side reactions involving chloral, chlorobenzene, H_2SO_4 , and impurities in the starting materials. The authors describe work on the proof of structure, including synthesis, of the byproduct materials; the *o,p'*- and the *m,p'*-isomers of *p,p'*-DDT and various derivatives of these compounds; and the synthesis of all the isomeric dichlorobenzophenones with one chlorine atom on each ring and of the 2,4-dinitrophenylhydrazones of these ketones.

Physiological evidence of a site of action of DDT in an insect, J. F. YEAGER and S. C. MUNSON. (U. S. D. A.). (*Science*, 102 (1945), No. 2647, pp. 305-307).—Experiments with the American cockroach indicated that the action of DDT differs from that of nicotine, the latter affecting the ganglia and DDT affecting the nerves somewhere along their length. This suggests that DDT can act more readily on the motor than on the sensory fibers, and that it can bring about repetitive discharges of nerve impulses somewhere along the motor fibers. Certain symptoms of toxicity (typical contractions and tremors of a leg) can result from the action of DDT at a site (or sites) common to the leg and body. It was strongly indicated that the site (or sites) referred to consist of that region of a nerve lying between the origin of its fibers in the ventral nerve cord and the terminations of its fibers in the leg exclusive of the origin and endings, i.e., the myoneural junctures of the fibers. It may be said also that all these findings are consistent with the idea that DDT can provoke contractions and tremors in other appendages, or in the body, by acting at a similar site on other nerves.

DDT and its effect on the Comstock mealybug and its parasites, W. S. HOUGH, D. W. CLANCY, and H. N. POLLARD. (Va. Expt. Sta. and U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 422-425)—Laboratory tests disclosed DDT at 1.5 and 2 lb. to 100 gal. water to be more effective against the newly hatched than other immature stages of the mealybugs and to have little or no effect against ♀ adults. The toxicity of the spray deposit was distinctly higher soon after spraying than 11 to 12 days later. Satisfactory control in a heavily infested orchard was obtained from use of the 1.5-100 spray directed against the young of the first and second generations or against the second generation only. Mites increased greatly on foliage receiving the DDT. Adults of the parasitic *Pseudaphycus* sp. proved very susceptible to spray deposits of DDT at all concentrations used (0.5-2 lb. per 100 gal.). Orchard parasitization was depressed following DDT applications but increased rapidly after spraying was discontinued in August. The species reared were *Allothropa burrelli* Mues., *Pseudaphycus* sp., and *Clausemia purpurea* Ishii.

Airplane application of DDT larvicides, C. C. DEONIER and R. W. BURRELL. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 425-427).—Because of certain undesirable physical characteristics of the dusts now available, DDT dusts have not been recommended for airplane application even though used successfully in that way. The high toxicity of DDT, however, has made possible the application of sprays from aircraft. The Cub spray unit has proved highly satisfactory with dosages as low as 1 qt. of 5 percent DDT spray per acre. The pay load is greater than with dusts, precision application can be accomplished, and sprays can be applied in more adverse weather than that under which dusting can be done successfully.

Hexachlorocyclohexane as an insecticide, L. B. BOURNE (*Nature [London]*, 156 (1945), No. 3951, p. 85)—A note on the successful use of this material as an insecticide in France during the war.

Influence of mercury on insect eggs.—Part 2, B. KRISHNAMURTI and M. APPANNA (*Cur. Sci. [India]*, 14 (1945), No. 7, pp. 168-170, illus. 2)—This part of the investigation (E. S. R., 93, p. 313) reports that mercury vapor penetrating the egg of *Corcyra cephalonica* prevented normal embryonic development, causing a destructive disorganization and disintegration of the cytoplasmic and nuclear structures. A simple ratio of 1 : 2 was observed between the minimum effective weights of Hg in certain similar volumes of empty and grain-filled spaces used. No definite ratio was evident between increases in the volumes of empty and grain-filled spaces and the corresponding increases in the minimum effective weights of Hg. The actual minimum effective weight of Hg for any volume of empty or grain-filled space was only a fraction of the apparent minimum effective weight for that volume. The actual minimum effective weight of Hg for any volume of grain-filled space, if used in the form of an amalgam, was also found to be effective against the eggs.

A key to the New World genera of Libellulidae (Odonata), D. J. BORROR. (Ohio State Univ.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 2, pp. 168-194, illus. 72).

A contribution to the knowledge of the Acrididae of Alberta, R. M. WHITE and P. J. G. ROCK (*Sci. Agr.*, 25 (1945), No. 10, pp. 577-596, illus. 3).—Since publication of the Orthoptera of Alberta by M. Hebard in 1930⁸ many new distributional records of this locust family have been obtained in this Canadian province. During the current grasshopper outbreak, which started in 1930, the authors, while making surveys of grasshopper abundance, have covered much of the farming area of the province. Since material was collected from over 2,500 localities they have divided the province into ecological areas for this copiously annotated listing of species; these areas are also shown on a map. The northwestern distributional

⁸ Acad. Nat. Sci. Phila. Proc., 82 (1930), pp. 377-403, illus. 1.

limits of a number of plains species and the southeastern limits of a number of boreal species are now more clearly defined than in 1930.

Tests of ingredients of grasshopper baits, R. R. WALTON and F. E. WHITEHEAD. (Okla. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 452-457).—Wheat bran and combinations of citrus pulp with sawdust or cottonseed hulls proved the most effective of 24 materials tested as bait carriers. Straight sawdust was 68 percent as effective as bran, and addition of any form of bran increased its effectiveness. Cottonseed hulls were about equal to sawdust as a carrier when used alone or with bran. Alfalfa leaf meal added to cottonseed hulls or sawdust failed to increase their effectiveness, and combinations of it with bran were less satisfactory than similar mixtures of bran with cottonseed hulls or sawdust. In preliminary tests, rice hulls and cane pulp were unsuitable alone or combined with bran. All-sawdust, all-cottonseed hulls, and mixtures of each with bran or mill-run bran were more effective baits, as compared with standard all-bran bait, when used during drought than when spread in succulent vegetation. Although heating in storage after preparation apparently impaired the effectiveness of mill-run bran-sawdust bait, it gave relatively fair results when moistened and remixed. Use of amyl acetate, molasses, and citrus fruit as attractants was of little value; their inclusion only added unnecessary costs. There was little difference between the value of bran-water and bran-lubrication oil baits over periods of several days. All baits containing low-grade fuel oil were distinctly inferior to similar carriers containing water or lubricating oil.

The influence of temperature, clouds, and time of day upon the feeding of grasshoppers on poison bait, R. R. WALTON and F. E. WHITEHEAD. (Okla. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 458-463, illus. 1).—The results of pan-bait and cage tests revealed that under Oklahoma conditions maximum feeding by the differential grasshopper occurs at air temperatures of 70°-88° F. In the cage tests, when the soil surface temperatures were at 95°-110°, the accompanying air temperatures were usually 78°-84°; the majority of maximum feeding periods occurred within these ranges, and feeding declined rapidly at soil surface temperatures above 112°. These findings are compared with similar work in other States. Cloudy days in Oklahoma usually proved less favorable than clear ones for poisoning grasshoppers; this influence appeared due to its effect on air and soil temperatures, particularly the latter. As to time of day, the maximum feeding on bait generally occurred in the forenoon. On the basis of these tests, it would seem desirable to spread baits early enough in the morning to have it ready for this maximum feeding; on the basis of work establishing the minimum feeding temperatures, however, bait should not be spread until the air or soil surface has reached 68°-70°, the range at which normal activity usually begins.

Observations on mole crickets and their control in Trinidad, B. W. I., E. M. CALLAN (*Trop. Agr. [Trinidad]*, 22 (1945), No. 8, pp. 146-149).—The changa (*Scapteriscus vicinus Scudder*) ranks as a major pest of vegetable gardens and lawns in Trinidad; the northern mole cricket is relatively rare. The nature of the damage, life history, natural enemies, and methods of control are described. Control in lawns involves bringing the pests to the surface with CS₂ emulsion or other means and then collecting and killing them. In gardens, protective collars are effective. In poison baits, fluorine compounds have proved rather more effective than the arsenicals; metaldehyde bait was ineffective.

Rate and extent of development of neotenic reproductives in groups of nymphs of the termite genus *Zootermopsis*, S. F. LIGHT and P. L. ILLG (*Calif. Univ. Pubs. Zool.*, 53 (1945), No. 1, pp. 39-†, illus. 16).—The authors found reproductivity to be most effectively measured in terms of the number of supplementaries (neotenic reproductives) produced in a given group or series of groups within a

given time after isolation from the parent colony. Other criteria in general agreement were the numbers of groups in which supplementaries developed, numbers of groups in which eggs or young were produced, and the numbers of eggs or young produced. Series from different colonies exhibited marked differences in the rate and extent to which supplementaries developed even though the series were run concurrently and the groups were the same as to types and numbers of nymphs. Series from the same colony, run at the same time but composed either of different types or combinations of types, showed marked differences in reproductivity. In general, when the groups were composed entirely of one instar, the younger instars exhibited low reproductivity, apterous nymphs had higher reproductivity than brachypterous (wing-padded) nymphs, and highest of all were the nymphs of very late instars—the so-called broad-heads—which are usually apterous but may possess wing pads. The authors' experience with large groups of mixed composition—although not documented by actual experiments—indicated, however, that in such groups the supplementaries are often of a comparatively young instar. Series of groups of the same or similar composition from the same colony but run at successive intervals showed great differences, indicating either that the potential reproductivity was very unstable, readily altered by handling and change of composition, or that it was subject to relatively rapid change—possibly cyclic in nature. A considerable variation in reproductivity was found between series of the same constitution, origin, and treatment, when run concurrently. Statistical methods revealed that these differences fell within the range to be expected from random variation. The differences pointed out between series of different origin, of different composition, or taken at different times were greater than those due to random differences, and would seem to be significant, although only further evidence can fully establish such conclusions.

The southward spread of the buffalo fly *Lyperosia exigua* and control methods adopted in Queensland, H. G. BELSCHNER (*Austral. Vet. Jour.*, 21 (1945), No. 3, pp. 56-60).—From the way this pest is advancing south in Queensland it is believed that its entry into New South Wales cannot be long delayed, and that it will continue until it has reached its climatic limits unless DDT saves the situation.

Buffalo fly: Fly movements and measures of control, J. LEGG (*Austral. Vet. Jour.*, 21 (1945), No. 3, pp. 60-64).—An address summarizing the situation in Queensland, including the limits of spread of the fly and its control, with notes on some experimental work.

New or little-known crane-flies from California (Tipulidae: Diptera), I. C. P. ALEXANDER (*Bul. South. Calif. Acad. Sci.*, 44 (1945), No. 2, pp. 33-45, illus. 4).—Includes four new species.

Gall midges and grass seed production, D. P. JONES (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 52 (1945), No. 6, pp. 248-251).—A brief account of the economic importance, detection, and control of damage to grass seed production by gall midges (Cecidomyiidae) in England and Wales.

Number of generations of *Lygus hesperus* Knt. and *L. elisus* Van D. in Alberta, R. W. SALT (*Sci. Agr.*, 25 (1945), No. 10, pp. 573-576, illus. 1).—Two errors in determining the number of annual generations of an insect are pointed out. Although specifically referring to the legume bugs *L. hesperus* and *L. elisus*, these comments are believed to apply in many other cases. The practice of calculating the number of generations from the length of the total season and the length of one generation is found inaccurate; variations in individual insects, combined with differences in environment throughout a field and a season, fail to allow the use of such simplified mathematics based on averages. In determining the number of generations per year from population curves, each stage and instar should be studied as a separate entity. The bulking of population figures of various stages and instars leads to inaccurate conclusions.

Bionomic notes on *Menecles insertus* (Say) (Hemiptera: Pentatomidae), W. V. BALDUF. (Univ. Ill.). (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 3, pp. 61-65).—The author's notes on this little-known stinkbug "add some personal observations and summarize briefly the bionomic data from the literature."

A new genus *Acunus* and eight new species of Mexican leafhoppers (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 2, pp. 199-206, illus. 2).

The reception of mechanical and thermal stimuli by caterpillars, H. FRINGS (*Jour. Expt. Zool.*, 99 (1945), No. 3, pp. 115-140, illus. 2).—Seven species of caterpillars—cecropia moth, imperial moth, monarch butterfly, imported cabbageworm, corn earworm, saddleback caterpillar, and *Euchaetias egle* Drury—were tested for reception of mechanical and thermal stimuli in noninjurious and injurious ranges. The typical reaction pattern was a movement of the anterior end of the body either away from the point stimulated—if on the thorax, or toward it—if on the abdomen. The hairs on the body walls were the receptors for tactile stimuli in these forms. Pressure elicited responses differing from those to touch; the receptors are believed to be either the subepidermal nerve net or the campaniform sensilla. The cecropia moth, saddleback caterpillar, and *E. egle* have receptors at least for heat above body temperatures; the imperial moth and monarch butterfly have receptors for heat above and below body temperatures. The receptors for thermal stimuli were not located. Each species responded to injurious stimuli with characteristically vigorous reactions easily differentiated from responses to simple mechanical or thermal stimulation. The term "nocireception" is proposed to describe the receptive processes involved; it is defined as the reception of harmful stimuli as indicated by responses of a typically violent and persistent type. The possibility that insects experience pain is discussed, but reception of and reactions to noxious stimuli must be clearly differentiated from perception of pain, the latter involving psychic adjuncts believed to be of questionable occurrence in lower organisms. There are 29 references.

The ennomid pupa (Lepidoptera: Geometridae), W. T. M. FORBES. (Cornell Univ.). (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 3, pp. 177-210).—These notes gathered by the author, are said to throw a definite light on the classification of this "now tangled subfamily" of geometrid moths and are therefore here presented. Considering primarily the pupal characters, he divides the Ennominae into two groups, which are described and tabulated. A key and descriptions of the species are included.

Two new variants in California *Colias eurytheme* (Lepidoptera: Pieridae), R. W. L. PORTS. (Univ. Calif.). (*Bul. South. Calif. Acad. Sci.*, 44 (1945), No. 2, pp. 49-50, illus. 1).

A pedicel gall on *Trichostema*, J. G. NEEDHAM (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 3, pp. 259-261).—Galls on the bushy mint, *T. suffrutescens*, are described. The moth causing the galls was identified as *Mompha sexnotella* Cham.

North American Cetoniinae with descriptions of larvae and keys to genera and species (Coleoptera: Scarabaeidae), P. O. RITCHER (*Kentucky Sta. Bul.* 476 (1945), pp. 39, illus. 62).—The structure, habits, distribution, and economic importance of this subfamily, which includes over 2,500 species of small to very large beetles, are discussed. Subfamily characters are given and a key is included for separation of the genera based on third-stage larvae. This is followed by descriptions of the larvae of the green June beetle, bumble flower beetle, *Gymnetis sallee* Schaum, *Cotinis texana* Casey, *Euphoria fulgida* (Fab.), *E. herbacea* Oliv., *E. sepulchralis* (Fab.), *Gnorimella maculosa* (Knoch), *Cremastacheilus pugetanus* Casey, other species of *Cremastacheilus*, *Osmoderma erinicola* Knoch., *O. scabra* (Beauv.), *Trigonopeltastes delta* (Forst.), *Trichiotinus assimilis* (Kirby), *T. affinis*

(G. and P.), *T. bibens* (Fab.), *T. lunulatus* (Fab.), *T. piger* (Fab.), *Valgus canaliculatus* (Fab.), and *V. seticollis* (Beauv.). Keys are given for separation of the species of *Cotinis*, *Euphoria*, *Osmoderma*, *Trichiotinus*, and *Valgus*. Besides the descriptions of larvae and the more important generic characteristics based on larval characteristics, 62 figures are included to make the paper readily usable. The pertinent references are cited in the bibliography.

Coprinae of eastern North America with descriptions of larvae and keys to genera and species (Coleoptera: Scarabaeidae), P. O. RITCHER (*Kentucky Sta. Bul.* 477 (1945), pp. 23, illus. 46).—Following a general discussion and brief literature review, a key is given to the genera of the subfamily Coprinae. The third-stage larvae of *Canthon pilularius* (Linn.), *Choeridium histeroideus* Web., *Pnatus carolinus* (Linn.), *Copris minutus* (Drury), *C. tullius* Olivier, *Phanaeus vindex* McL., *Onthophagus hecate* Panz., and *O. pennsylvanicus* Harris are described, and keys are included to the known larvae of the genus *Copris* and to the genus *Onthophagus*. A bibliography of important references is included, and the text is supplemented by 46 figures.

Variation in composition and volatility of Japanese beetle attractants during evaporation, R. D. CHISHOLM and L. KOBLITSKY. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 467-470).—Two methods of study were used, viz, fractional distillation under reduced pressure and evaporation under normal temperature and pressure from hollow cylindrical wicks. Comparisons of the boiling ranges of mixtures with that of a standard were indicative of the relative rates of evaporation, whereas comparisons of the refractive indexes of the individual fractions with that of the original attractant showed the uniformity of composition of the evolved vapors. Similar comparisons in the evaporation test involved determination of the weight of the attractant vaporized and measurement of the refractive index (n_D^{25}) of the residual attractant in the wick at specified intervals. When these technics were applied to certain Japanese beetle attractants, considerable variation was found in the evaporation rates—both within and between attractants. In some cases the composition of the evolved vapors remained almost constant; in others it varied and approached that of the decomposition products or of the least volatile constituents. These findings indicate that the methods described may prove useful in formulating insect-attractant mixtures.

Evaluating the effectiveness of sprays against the Japanese beetle: A laboratory method, W. E. FLEMING. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 308-312).—A method requiring relatively small amounts of test materials was developed for preliminary assay of the repellency of sprays against the Japanese beetle. These tests are conducted in the laboratory under controlled conditions of temperature, humidity, and light, thus eliminating the effects of adverse weather and the disruption of tests by the attraction of plants adjacent to an experimental field block. A latin square 7×7 is set up in a large chamber, the floor of which is covered with sand. Each series includes unsprayed plants, plants sprayed with lead arsenate, and five test sprays; 3,000 beetles are liberated in the chamber, and a record at intervals is kept of the number of beetles and the extent of feeding for each treatment. The effectiveness of each test spray is then compared with that of lead arsenate and evaluated according to the relative reduction of beetles and protection afforded the leaves. An assay can be conducted in 48 hr.; thus considerable information can be accumulated in a minimum of time. All preliminary data on the amount of a test material required, its resistance to weathering, the reaction of plants to the spray deposits, etc., can be determined on a small scale, so that future field tests can be limited to sprays exhibiting the greatest promise in these preliminary tests.

The association of nematodes of the genus *Diplogaster* with white-fringed beetles, R. B. SWAIN. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 488-490).—During a study of the nematode parasites of species of *Pantomorus* in the Southeastern States, several species of *Diplogaster* were found in widespread association. So far as known, the life histories of these *Diplogasters* associated with white-fringed beetles are identical, and they are briefly described. The most common relationship is that where the ensheathed third instar (dauer larva) merely rides around on the insect integument, entering it only after the death of the host. White-fringed beetle larvae with lacerations from which they might recover are subject to invasion by these nematodes, and it may be that larvae weakened by any cause can be invaded via the mouth or anus, but the number of beetles succumbing to direct attack is believed to be relatively small. *Diplogaster* was found a serious pest in artificial cultures of *Neoplectana* and in parasitization tests with the latter and other nematodes. The distribution of *Diplogaster* in areas infested with white-fringed beetles is such that its full benefit as a parasite or possible vector is probably being fully realized.

The Elateridae of New York State, H. DIETRICH ([New York] Cornell Sta. Mem. 269 (1945), pp. 79, illus. 4).—This brings together information on the described species of Elateridae of New York. Keys are included for all genera and species, with a short description of each species as well as known State records. Thirty-two genera and 208 species are discussed. Descriptions and keys are added for all wireworms of the State insofar as they are known. A brief account is given of the economic importance of this family, the characters useful in identification, and methods of collecting and preparations for study, with several significant references.

On the ecology of the wireworm *Dolopius marginatus* L. (Col.: Elateridae) in the South Wales Province, D. R. ARTHUR (*Ent. Mo. Mag.*, 4, ser., 6 (1945), No. 69, pp. 205-212).—Only this species of wireworm was found infesting the soils of South Wales; its distribution was markedly discontinuous and showed a significant correlation with factors inherent in or influenced by the surface geology. Where the latter resulted in good natural drainage and light or medium-light loams the species was recovered. No consistent correlations were found with other soil characters—pH, available phosphates, potash, or vegetational cover.

Nota sobre "*Homalotylus flaminus*" (Dalman, 1820) (Hym.: Encyrtidae), A. G. d'ARAUJO E SILVA (*Bol. Fitossanitário*, 1 (1944), No. 1, pp. 29-35, illus. 2).—A note on *H. flaminus* parasitizing *Cycloneda sanguinea* (L.), with taxonomic discussion and description of the species.

Studies of the spider prey of several mud-dauber wasps, M. H. MUMA and W. F. JEFFERS. (Md. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 2, pp. 245-255, illus. 6).—Rare and uncommon spiders as well as common species may be found among the provisions of mud dauber wasps. Prey collected by *Sceliphron caementarium* Drury is limited by the hunting environment of the wasp, the size and prevalence of the spiders, and the season. Prey collected by *Chalybion coeruleum* L. is affected by the same factors as the preceding, although it appears to change its hunting area occasionally. *Trypoxylon politum* Say collects common spiders among foliage, apparently preferring species of the genera *Neoscona* and *Eustala*. *T. clavatum* collects the small or immature spiders common on flowering plants in open areas.

Reaction of small-grain varieties to green bug attack, I. M. ATKINS and R. G. DAHMS. (Coop. Tex. and Okla. Expt. Stas.). (*U. S. Dept. Agr., Tech. Bul.* 901 (1945), pp. 30, illus. 9).—Because of a severe outbreak of the green bug in Texas, Oklahoma, and Kansas in 1942 an opportunity was afforded to observe varietal resistance in wheat, oats, and barley. The most resistant strains of wheat at Denton and Chillicothe, Tex., were selections from a cross Marquillo × Oro. Some

resistance was shown by Denton, Early Blackhull, Wichita, Blackhull, and Blackhull crosses as well as several Chinese and Russian strains, although none of these appeared to be sufficiently resistant to withstand heavy attacks. Several barley varieties, mostly of Oriental origin, proved resistant, surviving and maturing a crop when all surrounding strains were killed. Certain strains originating from crosses of Oriental barleys also showed high resistance. None of the oat varieties and strains, which included most of the commercial red oat varieties and hybrid strains, showed outstanding resistance although some differences in susceptibility were noted at Lawton, Okla.

The wheat stem sawfly in Montana, H. B. MILLS (*Montana Sta. II'ar Cir. 6, rev. 1945, pp. [6], illus. 2*).—This is a revision (E. S. R., 91, p. 176).

Arsenical residues in straw and grain from wheat dusted by airplane or treated with poisoned bait, L. B. SCOTT. (U. S. D. A.). (*Jour. Econ. Ent., 38 (1945), No. 4, pp. 464-466*).—The observations reported show that treatment of fields with arsenical bait, or with arsenical dust applied by airplane, is effective in controlling armyworms, infestation being reduced about 90 percent in 72 hr. Dead rats, mice, cats, dogs, and rabbits, as well as illness in a herd of cattle, were reported to have been observed in and near the dusted fields. Some analyses of straw and grain are presented; the residues were rather high in some cases (47.6 p. p. m. As_2O_3); in others they were low (3.7 p. p. m.). Some calculations of possible amounts of the arsenical dust or bait necessary to cause poisoning are given as based on figures presented by other workers for the toxic doses of arsenic for cattle and horses.

Trials with DDT on potatoes, cabbage, and squash, W. N. BRUCE and O. E. TAUBER. (Iowa Expt. Sta.). (*Jour. Econ. Ent., 38 (1945), No. 4, pp. 439-441*).—In these experiments, 3 percent DDT dust controlled the potato leafhopper, potato flea beetle, and potato aphid; 1 percent failed adequately to control the flea beetle but was effective against the leafhopper and severely checked the aphid. At 0.25 percent it effected some reduction in leafhoppers and aphids, but whether from repellency was not determined. Sulfur effectively controlled the leafhoppers. At the concentrations used, no toxicity to Irish Cobbler potatoes was noted. The imported cabbageworm was controlled as effectively by 1 as by 3 percent DDT; at 0.25 percent it helped but failed to give satisfactory control. There was some evidence that 1 percent DDT was a little more efficient than 1 percent rotenone dust. Average foliage damage and average yields were directly correlated in this experiment. The DDT dusts did not damage the cabbage plants. Against the squash borer, 2 and 3 percent DDT dusts proved the best concentrations used. Neither 1 percent rotenone nor 8 percent calcium arsenate dusts were as effective as 3 percent DDT, which gave nearly complete control of this pest. The absence of wilting and frass and the great increase in yield revealed the degree of protection offered by the 3 percent DDT. Neither the Hubbard nor the Buttercup varieties exhibited any foliage injury from the treatment; acorn squash and some muskmelon varieties, however, were retarded in development, especially in the early growth stages.

Fumigants for the cadelle in shelled corn, C. H. RICHARDSON. (Iowa Expt. Sta.). (*Jour. Econ. Ent., 38 (1945), No. 4, pp. 478-481*).—1,1-Dichloro-1-nitroethane, ethylene dibromide, CS_2 , methyl bromide- CCl_4 mixture (10 + 90 parts by volume), β -methylallyl chloride, CCl_4 , 1,1,2-trichloroethane, and ethylene dichloride were tested as fumigants in the laboratory against adults of the cadelle—a well-known grain pest—buried in small quantities of dry shelled corn. Methods of rearing the insect and the testing technic are briefly described. 1,1-Dichloro-1-nitroethane and ethylene dibromide were similar in toxic effect, as well as being the most toxic of the group. The next three fumigants were intermediate with respect to relative

toxicity, with CS_2 perhaps the most toxic. CCl_4 was most toxic of the remaining three compounds, but the differences between the dosages for 50 percent kill were not significant. The adult cadelle was more resistant than the red flour beetle, the rice weevil, or the saw-toothed grain beetle to CS_2 , β -methylallyl chloride, CCl_4 , and ethylene dichloride. The findings suggest that the usual dosage of these fumigants for the latter group of insects must be doubled to obtain effective control of the cadelle. CCl_4 produced a moribund condition in many of the cadelles which persisted for 13 days after treatment; at that time none of the moribund individuals appeared able to recover. At certain dosages, CS_2 produced a reversible anesthetic effect.

Effect of nicotine applied with calcium arsenate at different times of day upon cotton aphids and yields, M. T. YOUNG, G. L. SMITH, G. L. GARRISON, and R. C. GAINES. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 383-384).—Previous reports (E. S. R., 90, p. 803) indicated that increases in populations of the cotton aphid can be prevented by adding nicotine to the calcium arsenate used against the boll weevil. Information is here briefly summarized as to the effects on aphid infestation of the combination as applied at different times of day (E. S. R., 88, p. 362). Results in the different experiments varied greatly. Late-afternoon applications gave an average increase over early-morning applications of 125 lb. of cotton per acre, which is within the limits of experimental error. Midday applications gave no appreciable control of aphids in the one experiment made.

Effect of reduced amounts of calcium arsenate on boll weevil control and cotton yield, R. C. GAINES. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 300-304, illus. 2).—In field-plot experiments (Tallulah, La., 1933-43), the amount of calcium arsenate applied either alone or in mixture was greatly reduced from the average of about 6 lb. per acre; the dosages used in these tests significantly influenced the percentage of boll weevil control, but the effect on yields was not significant. Reductions in the amounts of the arsenate applied in cage tests were also followed by reductions in boll weevil kill.

Notes on *Helopeltis sanguineus* Popp. on cotton in Nigeria, F. D. GOLDING (*Bul. Ent. Res.*, 36 (1945), No. 1, pp. 75-78).

Tetralopha scortealis (Led.), a new insect pest of lespedeza, F. W. POOS and L. A. HETRICK. (U. S. D. A. and Va. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 312-315, illus. 2).—In recent seasons outbreaks of a web-forming caterpillar on lespedeza in Virginia has caused some concern. Since no previous reference to this insect as an economic pest has been found, the authors here present brief information on its taxonomy (Lepidoptera, family Epipaschiidae), seasonal life history, and control and on the species of *Lespedeza* attacked. The common name "lespedeza webworm" is proposed for it.

Observations on the biology and experiments on control of the mangold fly *Pegomyia betae* Curtis on sugar beet, A. ROEBUCK, F. T. BAKER, and J. H. WHITE (*Ann. Appl. Biol.*, 32 (1945), No. 2, pp. 164-170, illus. 2).—In ecological studies reported from England, some pupae of this fly from the second generation failed to emerge in late summer but emerged in the following spring, rather earlier than the pupae resulting from the third generation. The flies resulting from this early emergence were less fertile than those appearing later. Methods of control discussed include cultural, biological, and chemical means. Delayed drilling helped to avoid attacks by the first generation. A rapid increase in the number of parasites was observed and led to the annihilation of a large fly population. Treatment with a molasses-sodium fluoride bait spray gave promise of control.

Cost of producing *Macrocentrus* by the potato-tuber-worm method, H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 316-319, illus. 2).—The costs of producing 19 million *M. ancyliivorus* Roh. by the tuber

worm method are given; these, itemized, were salaries \$5,000, labor \$7,335, and potatoes \$2,835—a total of \$15,170, or about 78 ct. per thousand. This amount was exclusive of depreciation on buildings and equipment, and of certain supplies such as cardboard and sand for the cocoon sheets, heat, light, water, telephone, etc. As pointed out by Finney et al. (E. S. R., 91, p. 316), this technic is developing so rapidly that by the time descriptive material appears in print many details will have been superseded by improved procedures; in fact, recent studies on the removal of the parasite cocoon from the tuber worm cocoon may completely revolutionize the present methods of production and transportation of *M. ancyliivorus*.

Influence of moisture on the mass propagation of *Macrocentrus ancyliivorus*, G. L. FINNEY, C. H. MARTIN, and S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 319–323).—In the mass propagation of *M. ancyliivorus* Roh. it was found that the efficiency of propagation depended on regulating the evaporation of moisture from the tuber infested with the potato tuber worm. The rate of moisture loss was determined by the potato variety used (lower for Russet than for White Rose), the degree of infestation, and the amount of aeration. Under optimum conditions for efficient propagation of *M. ancyliivorus* the tuber, through evaporation, lost 75 percent of its weight in 20 days. A dry tuber such as Russet can be used efficiently when the evaporation power of the air is relatively low; a “moist” tuber such as White Rose can be so used when the evaporation power is relatively high. The difference in time of emergence of host and parasite populations may vary with the density of the host infestation, percentage of parasitization, and degree of uniformity in development of both host and parasite. Low humidities directly or indirectly tend to inhibit oviposition by *Macrocentrus*.

The role of the spermatophore in the mass propagation of *Macrocentrus ancyliivorus*, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 323–327, illus. 1).—Studies with *M. ancyliivorus* Roh., along with application of the information obtained to mass production of the parasite on the potato tuber worm, indicated that the maximum parasitization and percentage of ♀ parasites can be obtained under mass production by eliminating the factors preventing impregnation of the ♀ parasites. These factors, which include excessive heat, light, and parasite density during and for a short time after mating, appear to prevent the proper placement of the spermatophore or to cause its premature dislodgement and prolong the preoviposition period. The impregnation of the ♀ apparently depends on the position of the spermatophore in relation to the sperm duct. The spermatophore is cast out of the body before oviposition occurs. The progenies of unimpregnated ♀ ♀ may dominate over those of impregnated ♀ ♀ when competing for the same host.

Biology of the tobacco hornworm in the southern cigar-tobacco district, A. H. MADDEN and F. S. CHAMBERLIN (U. S. Dept. Agr., Tech. Bul. 896 (1945), pp. 51, illus. 24).—Studies were made of the biology of the tobacco hornworm at Quincy, Fla. On an average 254 eggs were laid per female, but the rate is probably higher in nature. In cages twice as many eggs were deposited on the upper surface of the tobacco leaf as on the under surface, but in the field this ratio was 4 to 1. The number of eggs per plant ranged from 0 to 74 during the growing season, the majority being deposited on the largest plants. Females oviposited without food, but feeding increased the rate. The average incubation period was 5 days, and almost all eggs deposited in nature were viable. The length of the larval period averaged 20 days. Under simulated field conditions it was 3 days less. The length of the incubation and larval periods varied inversely with temperature. Depth of pupation averaged 5.5 in. The prepupal period ranged from 3 to 8 days, while the average pupal period was 137 days. Variations in the length of the pupal period

cause the length of the life cycle to range from 33 days to 2½ yr. This hornworm is present in the field from about the middle of April to the first of November, and seasonal abundance is closely related to the tobacco-growing season. Synonymy, distribution, natural enemies, and host plants are given. Tobacco is the preferred host plant in the area in which the investigations were conducted.

Factors affecting curly top damage to sugar beets in southern Idaho, D. E. FOX, J. C. CHAMBERLIN, and J. R. DOUGLASS (*U. S. Dept. Agr., Tech. Bul. 897 (1945), pp. 29, illus. 7*).—Results from an 8-yr. study show that the factors which determine the source, magnitude, and time of dispersal of the beet leafhopper in relation to curly top incidence and sugar beet yield in south central Idaho are primarily dependent upon the date and magnitude of the spring leafhopper movements into the beet fields. Magnitude of these movements is determined by the number of leafhoppers entering hibernation, and by winter survival, host plant availability, and spring reproduction. Date of the spring movement is determined primarily by spring temperatures, which directly influence the rate of maturation of the insect. The spring movement has ranged from April 27 to June 13, with May 28 as the average date. Density of the beet leafhopper populations in the fall is lower on sugar beets than on Russian-thistle. The economic and epidemiological importance is greater, however, than the ratio on the two plants would indicate, since a higher percentage of beet leafhoppers from sugar beets carry the virus of curly top than those of Russian-thistle. Beet leafhopper populations and curly top incidence are generally greater in the beet fields nearest the spring breeding areas and decrease progressively away from these areas. Sugar beet varieties resistant to curly top have been grown exclusively in south central Idaho since 1935. These varieties have reduced the damage that can be caused by curly top, but have not solved the leafhopper problem.

The relation of spring movements of the beet leafhopper (*Eutettix tenellus* Baker) in central California to temperature accumulations (Homoptera), W. C. COOK. (*U. S. D. A.*). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 2, pp. 149–162, illus. 4).—Shade temperatures in standard U. S. Weather Bureau shelters are reported successful for use in calculating dates on which major spring movements of the beet leafhopper in the San Joaquin Valley, Calif., may be expected, a temperature accumulation of 825 day-degrees above 45° F. after January 1 falling close to the date of movement. This thermal constant was calculated in 1935, and migrations during 1936–40 have averaged within 3.64 ± 0.46 days of the calculated date. This particular summation would probably not be valid in other parts of the range of this pest, which would vary with latitude, altitude, and sunshine; the summation is deemed useful, however, for the California area. The findings indicate that beet leafhoppers leave their breeding grounds at the first opportunity after becoming adults.

Estimation of sugarcane top-borer, *Scirpophaga nivella* F., infestation, K. A. RAHMAN and D. SINGH (*Indian Jour. Agr. Sci.*, 14 (1944), No. 3, pp. 233–239).—In order to determine the best technics for obtaining reliable information on the incidence of this pest, the infestation percentage figures in samples of various sizes and shapes were examined statistically. For ordinary routine work, a sample consisting of 500 canes gave very accurate results, and there appeared to be little advantage from increasing the size of the sample beyond this figure. The precision was increased, however, by taking long and narrow strips of cane for counting purposes. In special cases, where greater efficiency is needed, three to six replications of the sample consisting of 500 canes from strips with 1 : 10 and 1 : 2.5 as the ratios of their breadth and length, respectively, should be taken.

Laboratory tests of insecticides for tobacco moth and cigarette beetle, J. N. TENHET. (*U. S. D. A.*). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 449–451).—

Under the test conditions it is believed that a minimum moribundity of 90 percent in 24 hr. is necessary to justify further research. On this basis only pyrethrum in oil (the standard of comparison), DDT, and the methylated naphthalenes proved capable of giving the desired results. DDT was effective against the tobacco moth at all strengths tested; at 5 percent it was about 50 percent effective against the cigarette beetle in 24 hr. and over 62 percent effective at 10 percent. The methylated naphthalenes were effective against the tobacco moth but not the cigarette beetle; since tobacco sprayed with these preparations retained an objectionable odor, they are unsuited for use.

The control of tobacco thrips on seedling peanuts, F. W. POOS. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 446-448, illus. 1).—In these preliminary experiments the level of control of thrips injury (one of the conditions commonly referred to as "pouts") by DDT was statistically significant; the damage by thrips to untreated plots was found of sufficient importance to justify considerable expense in its control. No injury to the plants by thrips was evident in plots treated with three formulas containing DDT, whereas the plants in untreated plots were severely injured in the seedling stage and had not equaled the treated plants in growth at harvest. The data indicate that control may be practicable under average weather conditions by two to three applications at weekly or 10-day intervals of a dust containing 2 percent or less, a spray containing 0.66 percent or less, or an aerosol containing 10 percent or less of DDT.

Effect of foods on ovarian development in the melon fly, R. H. MARLOWE. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 339-340).—The type of food on which the melon fly fed was observed to influence the ovarian development rate. Normal development occurred in flies fed on fruit juice, but in ♀♀ fed on sucrose or molasses solutions no development of the ovaries resulted in 30 days. Tartar emetic (120 p. p. m.) in cucumber juice retarded ovarian development and proved lethal in 27 days.

Adsorption of methyl bromide and its residual effect on fruitfly mortality, J. W. BALOCK and D. F. STARR. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 481-483, illus. 1).—In fumigation studies with methyl bromide against immature stages of the Mexican fruitfly the loss of gas as indicated by chemical analysis was found due to adsorption on the paint, wood, and steel of the fruit containers and lining of the fumigating chamber. From an initial dosage of 3 lb. per 1,000 cu. ft. the wooden containers adsorbed about 36 percent and the black paint on the inside of the drum 20 percent. With the paint removed, the amount adsorbed on the steel lining of the chamber was only 5 percent. Reversal of adsorption was tested by sweeping the chamber with compressed air for 10 min. and then resealing; the gas inside the drum increased from 0.13 lb. per 1,000 cu. ft. after 0.25 hr. to 0.43 lb. after 40.66 hr., when it apparently reached equilibrium. Window glass and asbestos-board panels were also tested for adsorption, with negative results. Adult Mexican fruitflies were inclosed in the fumigating chamber for 15 hr. after it had been aired; mortality after 3 days' airing was 95 percent, and even after 23 days 58 percent of the flies succumbed.

Timing the seasonal cycles of insects: The emergence of *Rhagoletis pomonella*, F. H. LATHROP and C. O. DIRKS. (Maine Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 330-334, illus. 3).—The apple maggot affords an excellent example of an economically important pest for the control of which insecticidal applications are timed to coincide with certain phases of its seasonal life cycle. This study presents data on the emergence of the flies, including its seasonal pattern and the influences of temperature, rainfall, and the date of petal fall. As a practical method for timing insecticidal control, the results proved reasonably satisfactory in each of the 11 yr. included—except for the 0.1-percent level in

1938 and the 90-percent level in 1942. In the future it should become possible by use of the proposed method to time the emergence of the flies within practical limits—other than for the infrequent years when an exceptional combination of climatic factors may introduce wide errors. It is not to be expected that many growers will attempt to estimate the dates of emergence in their orchards; this can be done by qualified workers and the information passed on to the growers. Many purely local variations in the emergence dates may occur; timing the dates with relation to apple petal fall should help to meet problems arising from such local factors. It is suggested that the U. S. Weather Bureau data may prove useful for estimating the emergence time of the flies; it also seems probable that predictions of temperature and rainfall may be made several days in advance, and it should be feasible to employ such forecasts in predicting emergence dates.

Solid baits for codling moth, J. R. EVER (N. Mex. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 344-346, illus. 1).—Although none of the attractants employed consistently excelled the fermenting cane sirup bait, certain ones—e. g., saffrole, phenyl acetic acid, pyruvic acid, and yeast—appeared promising and possessed the following advantages: Solid baits containing codling moth attractants of the essential oil and organic acid types are highly selective and catch very few insects other than this species. Muscoid flies, scarabaeid beetles, and miscellaneous Lepidoptera which frequent sirup traps and interfere with codling moth recording are practically absent. Trap jars provided with solid baits are filled with water alone and thus are cleaner and more easily observed and serviced. Solid baits may be prepared in advance of the flight periods of each generation and stored in a cool place, to be used as desired in the forecasting of spray schedules. When given proper protection, these baits are not adversely affected by rains or excessively high temperatures, as are sirup baits.

Further studies of apple spray schedule reduction, P. GARMAN (Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 341-343).—Experimental results to date render it apparent that stickers may be partly if not fully evaluated by laboratory tests with slides and leaves, and that the more successful stickers—including materials such as bentonite-skim milk, aluminum hydroxide gel, or aluminum silicate gel plus oil—are eminently successful in reduced programs for light to moderate infestations by insects. Where Fermate is the fungicide, disease control was also satisfactory under these insect conditions. Stickers are believed to afford much promise for generally reducing the spray program in Connecticut. However, these reduced programs are not claimed to control severe outbreaks of apple scab, codling moth, apple maggot, or even curculio; supplementary treatments may be necessary. Furthermore, the special mixtures will be hard to handle and may easily discourage the grower; also some of the ingredients may not be easily obtained. Conservatism regarding these reduced programs is therefore stressed as important.

Propylene dichloride for peachtree borer control—second report, O. I. SNAFF (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 419-422).—Further extensive experiments (E. S. R., 90, p. 375) during 1943-44 under dry and wet soil conditions in commercial peach orchards at Fort Valley, Ga., showed that excellent control of peach tree borer without tree injury can be obtained with propylene dichloride at half the strength recommended for ethylene dichloride. Even at the reduced strength the former was more effective than the latter against borers in the trees at unusual depths below the ground line. The results reveal a fair margin of safety in the use of propylene dichloride at the strength required to give a high degree of control. Use of broken-down emulsions of either material resulted in some bark injury and the control was reduced. With the soils included in these tests, it was not found necessary to break the crust before treatment with these

preparations to prevent runoff. Since they cost about the same, the propylene dichloride is the cheaper because of the lower strength required.

Further experiments with dichloroethyl ether for plum curculio control, O. I. SNAPP. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 417-418).—In further experiments during 1942-44 (E. S. R., 88, p. 367) in commercial Elberta peach orchards near Fort Valley, Ga., the effects of two applications of dichloroethyl ether on the soil under the trees for control of plum curculio did not differ significantly from that resulting from the regular schedule of three lead arsenate sprays on the fruit. No injury to vegetation under the spread of the trees or to any part of the trees themselves could be discerned from this treatment. However, the lead arsenate, with safener added and applied according to the regular schedule, caused severe leaf damage and heavy defoliation, some budwood injury, and in 2 of the 3 yr. a little spray burn on the harvested fruit.

Field trials of dichloro-diphenyl-trichloroethane (D. D. T.) against the raspberry beetle *Byturus tomentosus* Fabr., H. SHAW (*Jour. Pomol. and Hort. Sci.*, 21 (1945), No. 1-4, pp. 140-145).—DDT is compared with *Lonchocarpus* ground root in field trials against raspberry fruitworms. In each of two proprietary forms—one of which was unsatisfactory physically—and in a laboratory preparation, DDT at 0.025 or 0.05 percent gave as good control as a *Lonchocarpus* spray containing about 0.011 percent rotenone. The difference between treated and control plots was highly significant, but there was no marked difference in control as between either the products or the concentrations. In 1943 a single spraying with each of the materials was only moderately effective against a fairly heavy infestation; in 1944 double spraying gave excellent control of a lighter infestation irrespective of the spray used. In no case was there evidence of toxicity to plants. The proprietary material more satisfactory on physical grounds left a deposit on the fruit rendering the earliest pickings unsalable. Possible means of overcoming this disadvantage are suggested.

Biología de la filoxera de la vid (*Viteus vitifoliae* Fitch) en la Provincia de San Juan [Biology of the grape phylloxera in the Province of San Juan, Argentina], E. E. LÓPEZ MANSILLA (*Argentina Mém. Agr., Inst. Sanidad Veg.*, 1 (1945), No. 5, Ser. A, pp. 35, illus. 21).—Only the first and second larval stages were observed to overwinter in the region under study. The average figures found were 187 days of overwintering, 13 for incubation of the eggs, 152 for larval development, and 22 days for the oviposition period of the overwintering generation, with 84 eggs per individual. The figure for the incubation period of the spring and summer generations was 7 days, for the period of larval development 21 days, and for the oviposition period 18 days, with 81 eggs per individual. The number of eggs per ♀ decreased from the overwintering to the sixth generation. All ♀♀ were oviparous and parthenogenetic. Spread of the pest occurs through wandering larvae, winged migrants (observed for the first time in this region), and through tools and water; it dies on flooded vineyards. It is believed that the phylloxera of this region may represent a biological race. There are 40 references.

Repeated fumigation with HCN and the development of resistance in the California red scale, D. L. LINDGREN and R. C. DICKSON. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 296-299).—Two California red scale populations—one resistant and the other nonresistant—were obtained from the field and held without fumigation for some 70 generations to determine whether the resistants would revert to the nonresistant state believed to have been general at the time HCN fumigation was begun in California; under laboratory conditions the same differential was maintained throughout, even though the stock cultures received no fumigation. This differential was maintained in spite of the fact that the resistant scales were evidently not a pure resistant race, since repeated fumiga-

tions of samples increased the resistance. It is believed that resistance in any scale-infested grove has been brought about by selecting out the resistant individuals by fumigation, but even those groves with a record of being very resistant are not so resistant as they may eventually become. It is difficult to attribute the increased resistance entirely to elimination of nonresistant individuals, since in the repeated fumigations on resistant cultures the concentration of HCN was about two to four times as great as that used on the nonresistant red scale.

A partial explanation of the slowness in the practical elimination of genes for nonresistance may be found in the mechanism of inheritance. Though the ♂♂ are either entirely resistant or entirely nonresistant, it seems unlikely that many of them survived; the ♀♀, on the other hand, may be resistant, nonresistant, or semiresistant. The last are heterozygous, carrying genes for both resistance and nonresistance, and are midway between the two races in their ability to survive HCN fumigation. In a population predominantly resistant, very few ♀♀ homozygous for nonresistance will be found, nearly all the genes for nonresistance being carried by individuals that also carry genes for resistance. In the development of a purely resistant race, therefore, it is not the nonresistant individuals that must be eliminated so much as the semiresistant ones, which are relatively hard to kill by HCN. The more nearly the population becomes one of purely resistant scales, the greater is the likelihood that the genes for nonresistance present will be contained in semiresistant ♀♀, and hence the slower the population change.

The oral secretions of the pineapple mealybug, W. CARTER. (Pineapple Res. Inst. Hawaii). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 335-338, illus. 3).—The method of artificially feeding the pineapple mealybug is described: Its feeding tracks are deposited in plain agar gels. Additional elements of the oral secretions diffuse beyond the area of agar gel actually fed upon. The presence of radioactive phosphorus can be shown in the tissues of the mealybugs, is transferred from one agar gel to another by the insects, and can be recovered from the roots of plants fed upon by individuals charged with it. Artificial feeding of mealybugs on plain agar gels does not affect the ability of the insect to deposit feeding tracts or to produce green spotting or striping of pineapple leaves.

A termite damaging coconut-palms on Suwarro Island: *Calotermes* (Neotermes) *rainbowi* Hill, J. M. KELSEY (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 1, Sect. B, pp. 69-75, illus. 3).—The termite described is said to be responsible for considerable damage to coconut palms; several new characters for the species are included. Recommendations for controlling the damage to plantations are also presented.

Control of codling moth on walnuts—progress report, A. E. MICHELbacher (Univ. Calif.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 347-355, illus. 8).—The codling moth is said to be the most serious walnut pest in the Linden area of California, where there are two broods to control. Caterpillars of the first brood appear in May; those of the second, in July. For best control two sprays are necessary. The timing of the first is most important because of the rapid buildup of the first brood of caterpillars; this should be applied about May 1 and the second between about May 18 and the end of June. Standard lead arsenate with a safener proved more effective than basic lead arsenate; it has been used for 2 yr. without visible injury to the trees, but further work is needed before recommendation for general use. Tests with DDT (1944) showed much promise, as exceptionally good control was obtained. Most of the first brood entered the nuts at the blossom end; of the second brood, through the side or stem end. Nuts infested early in the season either drop prematurely or dry upon the trees. Bacterial blight or other injuries do not appear to be associated with worm infestation early in the season; later, such injuries apparently aid the caterpillars to gain entry into the

nuts, with the result that the number of culls other than caterpillar-infested in the harvested crop is likely to decrease as the worm infestation increases.

Insects feeding or breeding on indigo, *Baptisia*, S. W. FROST. (Pa. State Col.). (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 3, pp. 219-225).

The damage of *Melipotis acontoides* to the royal poinciana, J. R. WATSON (*Fla. Ent.*, 27 (1944), Nos. 3, pp. 58-59; 4, p. 103; 28 (1945), No. 1, pp. 18-19).

Insect pests of cultivated goldenrod, C. H. HOFFMANN. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 355-358).—A survey (1943) of plantings in five Southern States revealed attacks by many insects with diverse habits; some of the more common included thrips, stem borers, aphids, leaf rollers, leaf-feeding caterpillars, leaf miners, and leafhoppers. The identity, life history, and economic importance of most species are incompletely known. Thrips feeding on the terminal growth caused it to become stunted. The damage from stem borers appeared to be minor, since many plants survived attack and shoot proliferation was abundant after the terminals were killed. Selection 6S-30 proved most susceptible to the above species. Some of the stem borers were held partially in check by hymenopterous parasites.

Notes on the economy of the rose-galls formed by *Rhodites* (Hymenoptera: Cynipidae), K. G. BLAIR (*Roy. Ent. Soc. London, Proc., Ser. A*, 20 (1945), No. 1-3, pp. 26-31).

The viburnum aphid, *Aphis* (*Dorsalis*) *viburni* Scop., M. G. JONES (*Bul. Ent. Res.*, 36 (1945), No. 1, pp. 1-13, illus. 6).—This aphid is described and compared with *A. fabae* Scop. and *Ceruraphis eriophori* Wlk., also found on *Viburnum opulus*. Colonies were established artificially on *Euonymus europaeus* and *Rumex obtusifolius*, but not on other common host plants of *A. fabae*. The sexupara is apterous and produces mixed colonies, thus differing from *A. fabae* where an alate gynopara produces only oviparae, the ♂♂ arising from an apterous mother on the summer host.

Occurrence of *Trigonurus* (Coleoptera: Staphylinidae) in the coniferous forests of western Oregon, J. A. MACNAB and D. M. FENDER (*Bul. Brooklyn Ent. Soc.*, 40 (1945), No. 3, pp. 79-80).—Collection records of *T. sharpi* Blackwelder and *T. crotchii* Sharp.

An unusual outbreak of aphids on pine, C. H. HOFFMANN. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 375-377).—During the winter of 1943 and particularly in the spring of 1944 tremendous numbers of aphids (*Cimara* spp.) were observed feeding on different species of pine in North and South Carolina and Virginia. Many infestations were discovered because of the copious amounts of honeydew deposited either on or below the trees. Notes are presented on the results of this survey carried out with the assistance of many individuals during 1944.

Immature forms of the mite *Caeculus pettiti*, F. R. NEVIN (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 2, pp. 195-198, illus. 5).—The descriptions and illustrations given are based on a study of specimens of larvae and nymphs collected from pine needles in Virginia.

The biology and behaviour of *Ptinus tectus* Boie. (Coleoptera: Ptinidae), a pest of stored products.—VI, Culture conditions, D. L. GUNN and R. H. KNIGHT (*Jour. Expt. Biol.*, 21 (1945), No. 3-4, pp. 132-143, illus. 8).—In this part of the investigation (E. S. R., 93, p. 321), the highest temperature at which *P. tectus* should be reared was found to be near 24.7° C. Humidities over 70 percent cannot conveniently be used because of mold growth; lower ones prolong development. The best food tried was 95 percent whole ground wheat with 5 percent dried brewers' yeast, the smallest amount permitting complete development was about 3 mg. per individual; this produced miniature adults (one-third normal weight) in almost

normal time; about 30 mg. was required to produce full-sized adults—in both cases as reared in isolation. When a group of several larvae were reared in one container, development was prolonged by up to 40 percent, accompanied by some diminution in size; this is termed the “group effect.” With groups of 8 larvae, as much as 5 gm. of food per larva was required before the group effect disappeared. With quantities of food per larva which are optimum or supraoptimum for isolated larvae, the group effect reached its highest expression with 8 larvae per group; it diminished at smaller group sizes. Mass cultures exhibited the effect to about the same extent as groups of 8. Insects reared in groups showed a wider range of variation in size than those reared in isolation, but their developmental time was not more variable. No adequate explanation of this group effect and no method of producing from mass cultures individuals as uniform in size as those reared singly have yet been found. Adults came into full and fertile laying about a week after emergence from the cocoon. The rate of egg laying was markedly diminished if the insects were not given fresh food and water daily. A ♀ can live for a year and lay nearly 1,000 eggs. In starting mass cultures, it is best to allow a large number of insects in good condition to lay for a day or so; no better result was obtained by leaving them longer. This insect is said to be a convenient one for use in assaying insecticides.

β -Methylallyl chloride as a fumigant for insects infesting stored corn, C. H. RICHARDSON and H. H. WALKDEN. (Iowa Expt. Sta. and U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 471-477).—The physical characteristics, flammability, and effect on human health of this relatively new fumigant suggest that it can be used successfully with reasonable precautions. In laboratory tests using small gas-tight containers—both empty and filled with corn—it was about equally toxic to adults of the red flour beetle, saw-toothed grain beetle, and rice weevil. β -methylallyl chloride- CCl_4 mixtures containing 75 percent by volume of the former were indistinguishable in effectiveness from the β -chloride alone. Beyond this point the toxicity to the three test insects decreased with increasing proportions of CCl_4 , but a mixture containing 16.7 percent of the β -chloride still revealed equal toxicity to the red flour beetle and the rice weevil. CCl_4 proved more toxic to the former insect than to the latter, and as the β -chloride content of a mixture was further decreased its toxicity to these insects approached that of CCl_4 . Trials with shelled corn stored in steel bins of 2,000- and 2,740-bu. capacity gave 93 and 94 percent kills of the three insects with CCl_4 mixtures containing 12.5-16 percent of the β -chloride when applied at 2 gal. per 1,000 bu. For practical use the authors suggest a mixture containing 20 percent of the β -chloride at the rate of 2 gal. per 1,000 bu. of shelled corn in steel bins. The germinability of corn or wheat at 9.1-percent moisture content in gas-tight containers was not reduced by dosages of the β -chloride sufficient to kill the test insects—and probably most other grain-infesting species. Injury to germination increased with dosage and with moisture content of the grain. The ethylene dichloride- CCl_4 mixture (75-25) caused no observable reduction in germinability of corn or wheat.

Further analysis of fecundity in the flour beetles (*Tribolium confusum* Duval and *Tribolium castaneum* Herbst.), T. P. PARK and M. B. DAVIS (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 2, pp. 237-244, illus. 3).—Oviposition records of the confused flour beetle and the red flour beetle over 60 days are analyzed; it is shown that the latter has an approximately 6-percent higher fecundity rate and is also more variable. On the basis of selection of high and low strains of beetles it was possible to develop a stock of the red species with a 15-percent greater fecundity rate than the parental generation. It was not found possible to do this with the confused flour beetle, but some suggestions that may account for this failure are presented. Analysis of variance of the total data revealed conclusively that there

is more variability in respect to fecundity between pairs of beetles of both species than within the pairs.

Notes on the morphology of mosquito larvae, H. R. DODGE (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 2, pp. 163-167, illus. 1).—Several larval characters not usually referred to are set forth, particularly the gular sutures and the dorsal submedian prothoracic hair group. Distinctive characters of *Mansonia*, *Culex*, and *Uranotaenia* are discussed, and new characters for separating *U. lowii* from *U. sapphirina* and *C. nigripalpus* from *C. salinarius* in the later instars are proposed.

Occurrence and distribution of mosquitoes in Mississippi, A. G. PETERSON and W. W. SMITH (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 378-383).—Recent intensive mosquito collection work is reported to have increased to 52 the number of species known to occur in Mississippi. Brief notes are presented on the distribution and observed larval habitats of each species.

The nutrition of the larva of *Aedes aegypti* L., I. B. DE MEILLON, L. GOLDBERG, and M. LAVOPIERRE (*Jour. Expt. Biol.*, 21 (1945), No. 3-4, pp. 84-89).—A technic for studying the nutritional requirements of the yellow fever mosquito larvae under sterile conditions is described, and a method for the more accurate recording and interpretation of the results is presented. First-stage larvae may be kept in agglutinating broth up to 96 hr. without affecting their subsequent growth in suitable media. A suspension of autoclaved brewers' yeast in CaCl_2 solution supports growth and metamorphosis. Storage of the dried yeast for a long period, or the autoclaved fresh yeast for shorter periods, had a marked effect on the growth rate when these yeasts were combined with liver extract or vitamin mixture; a similar effect resulted from prolonged autoclaving. In all these media, liver extract may be replaced by admixture of B vitamins, but the solid yeast fraction was not replaceable by any combination of substances tried. The time for the change from pupa to adult was independent of the medium in which the larvae were grown. A factor was found which causes the emergence of vigorous adults in nature or in contaminated media; this factor was largely absent from the best media used, such as brewers' yeast and liver. See following entry.

The nutrition of the larvae of *Aedes aegypti* L.—II, Essential water-soluble factors from yeast, L. GOLDBERG, B. DE MEILLON, and M. LAVOPIERRE (*Jour. Expt. Bio.*, 21 (1945), No. 3-4, pp. 90-96).—Autolysis products of fresh brewers' yeast, tested for ability to promote growth of the larvae, revealed the loss of an essential part of the activity of the original yeast; under suitably modified conditions this loss could be avoided. A basal medium comprising the water-insoluble factor of brewers' yeast, glucose, salt mixture, and yeast nucleic acid required supplementation with thiamine, riboflavin, niacin, pantothenic acid, and possibly biotin to permit larval growth to the fourth instar. For pupation, one further factor appeared necessary, viz, folic acid; its effect was specific and it exercised an important influence on growth and survival rates, bodily pigmentation, and size of larvae. When added to or withheld from various media, other B vitamins, amino acids, purines, pyrimidines, glutathione, ascorbic acid, and possibly vitamin K did not appear to influence growth or survival of the larvae. Transference of the larvae from a folic acid-free medium to one containing it, and vice versa, revealed that its presence appeared to have its most vital effect during the third stage of larval life.

The anopheline mosquitoes of the Australasian region, D. J. LEE and A. R. WOODHILL (*Sydney Univ., Dept. Zool. Monog.* 2 (1944), pp. 209+, illus. 55).—Following a historical and general section, this monograph presents information on the morphology and classification of the group, a systematic list of species, type localities, a summary of distributions and records, keys to the adults, larvae, and eggs of the species, and descriptions of the individual species. An appendix considers the 12 species recorded from the western fringe of the Australasian

region. A bibliography of over four pages and a subject-author index complete the work.

Insectary rearing of *Anopheles pharoensis*, O. H. THEODOR and B. T. PARSONS (*Bul. Ent. Res.*, 36 (1945), No. 1, pp. 79-83).—A description of the procedures by which a colony of this mosquito was maintained for three generations.

***Anopheles pseudopunctipennis* in the Los Chillos Valley of Ecuador**, R. LEVI-CASTILLO (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 385-388, illus. 3).—The author presents a general account of the geographic distribution, breeding places, habits and ecology, limits of infestation, and control of *A. pseudopunctipennis*; the particular form of the mosquito in this region he considers a distinct variety which he has named *rivadeneras*.

[**Brief papers on mosquito control**] (*Mosquito News*, 5 (1945), No. 2, pp. 45-51, 54, illus. 1).—The following are included: Ten Years of Mosquito Control Problems and Progress at Norfolk, Virginia, by P. W. Ruth (pp. 45-48); The Jeep—a New Vehicle for Mosquito Control, by R. E. Dorer (p. 49); Lotus Borer Ecologically Antagonistic Toward Mosquitoes, by C. A. Wilson (p. 50); Tests With DDT as an Anopheline Larvicide, by F. F. Ferguson, W. M. Upholt, and E. H. Arnold (p. 51); and Field Tests of DDT in Solution in Crank Case Oil as a Larvicide Against Anopheline Larvae, by M. A. Barber (p. 54).

The larvicidal action of DDT on *Anopheles quadrimaculatus*, J. D. MAPLE (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 437-439).—DDT was shown to act on anopheline larvae as a nerve poison, disorganizing their movements so that they could not retain contact with the water surface. The toxic dose could be obtained either by contact or ingestion. Because of the larval feeding habits, a surface application was usually ingested, but a short exposure only to DDT in oil solution was toxic by contact. Death resulted from drowning even when sublethal doses were given. Heart action in the posterior of the abdomen was always the last visible sign of life; this often did not cease for over 24 hr. after the first tremors appeared.

DDT sprays mechanically dispersed for control of anopheline mosquito larvae, C. B. WISECUP, R. W. BURRELL, and C. C. DEONIER (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 434-436).—Tests conducted on natural breeding areas demonstrated that finely dispersed sprays could be drifted under favorable conditions for several hundred feet across open areas with resulting satisfactory control. Such a method of application can utilize various types of equipment available to the armed forces, such as decontamination cylinders, knapsack sprayers, and paint sprayers. Mechanically dispersed mists should be especially valuable in area treatments where pot holes, hoofprints, wheel ruts, and other small depressions provide places for anopheline larvae, or in breeding areas that are difficult to treat because of depth of water or other reasons.

DDT water emulsion in rice fields as a method of controlling larvae of *Anopheles quadrimaculatus* and other mosquitoes, F. L. KNOWLES and F. W. FISK (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 35, pp. 1005-1019, illus. 11).—A method is described for applying DDT water emulsion at the pump to flooding waters of a rice field. Data from 28,000 dipping records of mosquito larval counts are presented according to dosage, solvent used, and position of the plot. Larval counts increased with distance from the pump, indicating a gradual loss in toxicity as the water flowed through the canals and rice fields. Two plots of the treated field contained 50 percent fewer anopheline and 72 percent fewer culicine larvae than the untreated field. In a series of $\frac{1}{20}$ -acre plots, complete control of anopheline and culicine larvae was obtained at DDT concentrations of 1 and 0.2 p. p. m., respectively. Samples of rice stools showed about 50 percent fewer rice water weevil larvae in a treated than in an untreated field. Yields of harvested rice in

a DDT-treated 100-acre field were higher than the average or highest yields for previous years from untreated fields, indicating that DDT did not injure the growing rice. Although these findings show a reduction of mosquito larva production by DDT applied to the flooding waters as they enter the rice fields, it is pointed out that it was by no means eliminated.

Larvicidal aerosols containing DDT, H. A. JONES, C. C. DEONIER, R. W. BURRELL, and E. F. KNIPLING. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 432-433).—Liquefied-gas aerosols have been ascertained to offer possibilities for applying DDT against anopheline larvae. In laboratory tests complete mortality of larvae was obtained up to 60 ft. from the point of release. When fatty acids were incorporated in the aerosol the deposits remained effective after several artificial rains. In tests of several aerosol formulas applied from the ground in the field, practically complete kills of anopheline larvae were obtained at 0.1 lb. of DDT per acre.

The morphology of the mouthparts of the non-biting blackfly *Eusimulium dacotense* D. & S. as compared with those of the biting species *Simulium venustum* Say (Diptera: Simuliidae), H. P. NICHOLSON. (Minn. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 2, pp. 281-297, illus. 25).—The author describes in detail and figures the mouth parts of both sexes of *E. dacotense*—a species whose mouth parts are so weakly developed that they cannot pierce the skin to feed on blood—and presents notes on its biology. He also compares its mouth parts with those of the biting blackfly *S. venustum*.

Evaluation of materials for louse control, M. ASCHNER and J. MAGER (*Ann. Appl. Biol.*, 32 (1945), No. 2, pp. 143-148, illus. 3).—A simple procedure for evaluating the effectiveness of different louse-killing substances is described. Factors likely to affect the results are discussed, and it is shown to what extent differences in age, mode of application, and interaction of carriers are able to influence the insecticidal effects. Various substances were tested and their potencies against lice determined by comparing the minimum time of exposure necessary to give a 100-percent kill.

Some pioneer work on protection against body lice by the use of lasting insecticides, J. R. BUSVINE (*Bul. Ent. Res.*, 36 (1945), No. 1, pp. 23-32, illus. 1).—The author describes part of an extensive program of research on new methods of controlling body lice carried out during 1940-42, in which the possibility of continuous protection over several weeks was for the first time shown. "To some extent, the materials and methods of achieving this have now been improved or superseded; but it has seemed worth putting on record some details of technic and the results for their scientific interest."

Grub control on dairy cattle in the Northeast, J. G. MATTHYSSE. (Cornell Univ.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 442-446).—The primary loss to dairymen by cattle grubs is believed to lie in lowered milk production, especially during periods of warble fly attacks. The only practical control found consisted of two dustings, the last just before the cattle are turned out to pasture and the first about a month earlier; rotenone is the only insecticide known to be effective. Pyrophyllite has proved a more efficient diluent than wettable sulfur. A dust composed of 1 part cube and 3 parts Pyrax ABB gave satisfactory control. The results of increasing the concentration to 1 part of each did not appear to warrant the added expense. A small area was selected and all cattle within it were treated once in April and again in May, using the 1 : 3 dust; there followed a very appreciable decrease in incidence of warble fly attacks in this area, and counts a year later indicated a marked decrease in the grub populations. Sprays containing DDT applied to the legs and undersides of the bodies before turning cattle out in spring proved of no value. Notes are included on the seasonal activities of cattle

grubs in New York State and on the extreme variations in populations to be encountered. Because of these extreme variations it is necessary to use large numbers of cattle and grubs in experiments on warble fly control. The infestations found were largely of the northern cattle grub, but about 20 percent of the live grubs found were the common cattle grub.

Screwworm survey of the Southeastern States in 1944, W. G. BRUCE. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 327-329, illus. 1).—This survey revealed screwworm infestations throughout Florida, the southern three-fourths of Georgia, the southern third of Alabama, and most of South Carolina. It is deemed very probable that the pest overwinters in southern Georgia. Infestations reached outbreak proportions only in local areas of Florida and southern Georgia; they appeared mostly in the navels of newborn animals, in castration, earmarking, and branding wounds, and in lesions caused by the Gulf Coast tick during late summer and early fall. Climatic conditions favored screwworm development until November; this, combined with shortages of experienced farm labor, contributed to the widespread distribution. As a result of this survey the incidence and relative abundance of screwworms in the Southeastern States were determined and an estimate was made of the critical insecticides needed. A large number of stockmen used the approved control measures, greatly reducing the number of infestations and almost eliminating the losses from screwworm attacks.

Biology of *Ixodes dentatus* Neumann (Ixodidae), C. N. SMITH. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 2, pp. 223-233).—This paper presents the results of a study of the typical tick of this species, which occurs in the eastern part of the United States. Information is included on its life history, hosts (almost exclusively rabbits), seasonal activity, parasitization by *Ixodiphagus texanus* How., and oviposition without Gene's organ.

The control of the sheep-tick, *Ixodes ricinus* L., by treatment of farm stock, A. MILNE (*Ann. Appl. Biol.*, 32 (1945), No. 2, pp. 128-142).—The practical difficulties of treating sheep, lambs, and cattle against the castor-bean tick are outlined, and the results of testing 39 experimental and commercial antitick preparations on these animals are presented in detail. Thus far, no experimental dip is said to have surpassed a commercial product comprised of sodium arsenite, ground derris root, cresols, and wool fat. Against the ♀ tick, 30-sec. immersion killed all those attached at the time of treatment; it also kept the sheep free of ticks for 7 to 10 days, and reinfestation was not complete until 3 to 4 weeks after dipping.

Large scale power dusting of feeder lambs for winter control of the sheep tick, J. G. MATTHYSSE. (Cornell Univ.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 285-290, illus. 6).—This method was found to offer an easy, rapid, and very effective control of the sheep tick on feeder lambs; it was devised for cold weather conditions, when dipping is injurious. The lambs are run through a chute past a bank of duster nozzles, a high-powered machine such as a 5-hp. 18-nozzle crop duster being necessary. Under commercial conditions 2,000 lambs could be dusted in a day at a cost for materials of about 1 ct. per head. The most effective dust tried was a mixture of 1 part cube root (4.8 percent rotenone) and 10 parts Pyrax AAB, with 2 percent No. 10 motor oil added. This preparation yielded over 90 percent kill of ticks in 2 days, with very little subsequent reinfestation during the feeder period. Dusts containing sulfur were found too irritating to the eyes of operators for practical use. DDT proved ineffective. The rotenone-oil dust in all cases gave satisfactory control without ill effects to either the lambs or the operators. Inclusion of the oil weighted the material and reduced the dust cloud so that rotenone irritation to the operators was very slight.

DDT has possibilities of becoming a remedy for sheep ticks, N. G. COBBETT and C. E. SMITH. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No.

822, pp. 147-148).—Preliminary field tests indicated that as little as 0.1 percent DDT in aqueous suspension may compare favorably with rotenone products for controlling the sheep tick; dipping the sheep in suspensions containing as much as 1 percent resulted in no apparent injury to the animals. Only the agitation of the dip from movements of the sheep prevented the DDT from settling to the bottom. The practicability of incorporating DDT in sheep dips will thus depend largely on finding a suitable solvent or satisfactory suspending and dispersing agents for the insecticide.

The effects of DDT administered orally to cows, horses, and sheep, L. W. ORR and L. O. MORR. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 428-432).—Tests in which large amounts of DDT were administered to cows, horses, and sheep as a dry powder or in water suspension demonstrated that the chemical is not acutely toxic to them. Most of the material is evidently eliminated from the body, although small amounts may be taken up by the blood stream. Hemorrhages were frequently produced in the heart and intestinal linings. There was unusually marked loss of appetite, probably associated with the intestinal lesions, which may prove important in keeping animals from ingesting large quantities of the chemical over a prolonged period. The nervous system is likely to be affected, although there appeared to be marked variation among species. Some indications were found that individual animals develop a tolerance to DDT. The effects of DDT dissolved in oils or other organic solvents should be determined, as it is possible that solutions of the chemical would be much more readily assimilated. The findings from these tests do not, however, give reason to expect any bad effects on domestic animals from the proper use of DDT as an insecticide when applied as a dust or in water suspension.

Bee-keeping, C. G. BUTLER ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul.* 9, 7. ed., rewritten (1945), pp. 27+).—A general informative bulletin.

Value of pollen substitutes for brood rearing of honeybees, M. H. HAYDAK. (Minn. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 4, pp. 484-487).—Queenright colonies of about equal strength composed of emerged bees which had never eaten pollen were confined and fed soybean flour supplemented with 1-year-old pollen, dry skim milk, dried brewers' yeast, or dried egg yolk. In an experiment lasting for three consecutive 10-day periods the mortality in all test colonies was about the same. Those fed soybean flour supplemented with the yeast alone or with added yolk produced about twice as much brood as those fed soybean flour supplemented with either dry skim milk or pollen.

Transmission of American foulbrood by heated spores of *Bacillus* larvae and their growth in culture, C. E. BURNSIDE. (U. S. D. A. coop. Univ. Wyo.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 365-368).—Spores of *B. larvae* were boiled for different periods up to 5 hr. in water and in honey diluted with equal parts of water; when subsequently tested by culturing on nutrient medium many of the spores grew after prolonged incubation, but American foulbrood was not produced in any of 62 colonies of bees inoculated with them. Spores were also heated for varying periods in beeswax, which was then incorporated in brood foundation either by spraying onto commercial foundation or by making wax rendered from American foulbrood combs into foundation. Colonies were inoculated by giving them 10 sheets of the foundation. The disease was produced in 2 out of 4 colonies given spores in the wax sprayed onto foundation and in 7 out of 15 given foundation made of wax from infected combs. The manufacture of commercial wax foundation through purification and heating of the wax is believed to alleviate all danger of disease transmission. Spores of *B. larvae* that are normally capable of germinating soonest are probably the most highly virulent but are the first to be destroyed by heating. Spores normally requiring prolonged incubation to germinate are highly

resistant to heating but probably are nonvirulent; those requiring 2.5 or more days longer than normal to germinate cannot cause infection, since larvae pass their susceptible age before the spores can grow. Boiling for 30 min. can be depended upon to destroy the virulence of spores of *B. larvae* under any ordinary conditions.

The cause of paralysis of honeybees, C. E. BURNSIDE. (U. S. D. A. coop. Univ. Wyo.). (*Amer. Bee Jour.*, 85 (1945), No. 10, pp. 354-355, 363).—The term "paralysis" is commonly used to designate disorders of adult honeybees characterized by trembling, sprawled legs and wings, occasional hairlessness, and in some instances a black shiny appearance. The death rate may be heavy in the more easily recognized cases. No pathogenic micro-organisms have been found associated, and the cause has long been undetermined. The authors conclude from their observations and experimental results here presented that the disease is caused by a filterable virus and that it is the disorder commonly referred to as "paralysis of adult honeybees," as distinguished from other types of bee paralysis.

The effect of DDT on honeybees, J. E. ECKERT. (Univ. Calif.). (*Jour. Econ. Ent.*, 38 (1945), No. 3, pp. 369-374, illus. 1).—The results of this study confirmed previous reports that DDT acts both as a contact and a stomach poison to bees. Since they did not all die after various concentrations of the dust were shaken over them in the hives, it apparently does not always kill bees on bodily contact alone. It is believed possible that specific amounts must be absorbed through portions of the bee's external anatomy in order to be injurious. Since the comparatively large percentages of DDT in the pollen paste used had no observable effects on the population or brood of the colonies to which the mixture was fed, perhaps DDT in dust form is less injurious than arsenicals when fed in this way. If, however, bees were continually exposed to DDT dusts while collecting pollen, the results might differ entirely from those indicated in the preliminary tests here reported. Why the bees were killed by queen-cage candy containing small amounts of DDT, but not by pollen paste containing much larger quantities, cannot be explained until more is known about how pollen paste is converted into food for adult and brood bees. If DDT should be used as carelessly as other insecticides are now employed, there is reason to believe that it might become more destructive than any other insecticide now known. Conceivably, however, its use and distribution might be more adequately regulated, so that only minimum amounts would be used to take the place of arsenicals, and the material might be confined to the plants treated and not applied when they are in bloom. Apiculture is said to be doomed in those areas where arsenicals and other toxic substances are broadcast by airplanes and powered blowers without regard to the damage the drifting poisons might cause.

Silk culture in America, W. S. ROBERTS ([n. p.]: *Author*, 1945, pp. 77+, illus. 45).—A textbook on silk raising.

ANIMAL PRODUCTION

Farm animals and working and sporting breeds of the United States and Canada, D. C. HOGNER (*London and New York: Oxford Univ. Press*, 1945, pp. 194, illus. 164).—Brief popular descriptions are given of various breeds of horses, cows, sheep, goats, hogs, dogs, cats, rabbits, and guinea pigs. The names and addresses of the breed associations in the United States are included.

Physiology of farm animals, F. H. A. MARSHALL and E. T. HALNAN (*Cambridge, Eng.: Univ. Press*, 1945, 3. ed., [rev.], pp. 339+, illus. 119).—This book is the third edition (E. S. R., 68, p. 653) of the physiology of farm animals, including poultry, and takes up the effects of the different systems of the body and their relation to growth.

Some preliminary observations on the effect of molybdenum on copper metabolism in herbivorous animals, A. T. DICK and L. B. BULL (*Austral. Vet. Jour.*, 21 (1945), No. 3, pp. 70-72).—Analyses of the livers of three cows which were stall fed and received 904 gm. of molybdenum as ammonium molybdate over a period of 3 yr. 9 mo., and of three cows on pasture and receiving approximately 690 gm. of the molybdenum over a period of about 3 yr., showed a small copper content which ranged from 10 to 58 p. p. m. In a second experiment six groups of five ewes each received 0-100 mg. of molybdenum per day over a 6-mo. period. These ewes showed a marked reduction in the copper content of the livers. The copper deficiency resulted from the molybdenum treatment of these animals for hematuria vesicalis. The amount of copper in the liver was reduced even when copper was added to the ration.

The digestibility of Alyce clover hay and native grass hay, L. L. RUSOFF, D. M. SEATH, and G. D. MILLER (*Dairy Res. Digest [Louisiana Sta.]*, 3 (1945), No. 3, p. 1).—The total digestible nutrients in the dry matter of Alyce clover hay were 55.58 as compared with 40.26 percent for native hay, and the latter was not as palatable.

Commercial feeds in Kentucky in 1944, J. D. TURNER, S. B. RANDLE, W. G. TERRELL, and J. J. ROSE (*Kentucky Sta. Regulat. Ser. Bul.* 43 (1945), pp. 38).—A summary of official inspection and analyses of the feeds in 1944, along the lines of the previous year (E. S. R., 92, p. 687). A discussion of urea as a source of protein is included.

Analyses of commercial feeding stuffs and registrations for 1945, C. S. CATHCART (*New Jersey Stat. Insp. Ser.* 19 (1945), pp. 47).—A summary of the guaranteed and found analyses of 1,462 samples of feeds officially examined in 1944, grouping the types of feeds as in the 1943 report (E. S. R., 92, p. 688).

Potatoes increase value of corn fodder and alfalfa hay silages for cattle feed, W. E. CONNELL, L. E. WASHBURN, R. C. TOM, E. M. MERVINE, and H. H. KOB (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 4, pp. 7, 12-15, illus. 1).—Comparison was made of different succulent roughages for fattening eight lots of steers over a period of 196 days. There were no significant differences between the gains produced by the three lots fed alfalfa silages made in a trench silo and those fed corn silage. Two of the alfalfa silages were preserved with phosphoric acid or corn silage. Faster gains at lower cost were produced by steers receiving corn silage than by those on any of the three alfalfa silages. There was less carotene lost on the alfalfa-phosphoric acid silage than on any of the three other types of alfalfa silage, and the acidity was more normal than in the other two alfalfa silages. Wet beet pulp produced slightly faster gains at lower cost than corn silage. Potato-corn fodder silage and potato-alfalfa hay silage each produced faster gains at lower feed costs than corn silage. Dehydrated potato meal was almost as palatable as ground corn and produced slightly higher gains, and the steers finished out nicely. There were 8 to 10 steers averaging about 760 lb. in each of the 8 lots.

Coe's sorghum proves good feed for cattle fattening; wheat is good corn substitute, W. E. CONNELL and R. C. TOM (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 4, pp. 3-5, illus. 1).—In 185 days, lots of 9 steers on ground corn and ground Coe's sorghum equal parts with soybean meal and roughage of cane silage or half cane fodder made average daily gains of 2.33 and 2.27 lb., respectively. When ground wheat or ground barley replaced the ground corn in the rations with ground Coe's sorghum meal and cane silage, the average daily gains were 2.4 and 2.16 lb., respectively. In general, good gains and high quality beef were produced on the ground Coe's grain. There was no advantage from replacing one-half of the cane silage in the lots receiving ground corn and ground Coe's with an equivalent amount of chopped cane fodder, and the carcasses did not grade quite as high.

Aberdeen-Angus cattle in Canada, F. W. CRAWFORD (*Winnipeg: Canad. Aberdeen-Angus Assoc.*, 1944, pp. 173+, illus. 68).—Largely descriptions and illustrations of the more outstanding members of this breed in Canada and their owners.

Shepherd's empire, C. W. TOWNE and E. N. WENTWORTH (*Norman: Univ. Okla. Press*, 1945, pp. 364+, illus. 37).—The romantic trail of sheep through America, from the introduction by soldiers in the sixteenth century to establishment on the sheep ranges of the United States, is reviewed and many details are incorporated in the text from sheep breeders' journals and public documents which are listed in the extensive bibliography.

Hairiness in wool.—I, **Distribution of hairiness in the fleeces of New Zealand Romney Marsh ewe hoggets**, H. GOOT (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 1, Sect. A, pp. 45-56, illus. 2).—A statistical analysis is reported of the relation of hairiness in 6 locations each in the forequarter, side, and hindquarter regions to the whole fleece of about 1,800 New Zealand Romney ewes approximately 14 mo. of age, born between 1936 and 1941, and reared under average conditions. On the basis of these results, the distribution of hairiness over the whole fleece and the relation in certain regions were calculated. A suggestion is made for reducing the number of samples taken for routine benzol test examination of the fleece hairiness from 6 or 18 to 1 hindquarter position, thus considerably reducing labor, time, and money involved. Regression equations are given for each of the positions. These show that the hindquarters are the most hairy, the forequarters the least, and the sides fall between. In addition, determination was made of variance between the estimates of the whole fleeces of each of the positions.

Largest, cheapest gains obtained from wet beet pulp in lamb feeding experiment, A. L. ESPLIN, W. E. CONNELL, L. E. WASHBURN, R. C. TOM, E. M. MERVINE, and H. H. KOB (*Colo. Farm Bul. [Colorado Sta.]*, 7 (1945), No. 4, pp. 5-7, 8-9, illus. 1).—Comparison was made of five grain mixtures, whole corn, five silages, and wet beet pulp for 12 lots of 20 79-lb. lambs fed for 120 days. All of the lambs received alfalfa hay. The best average daily gain (0.38 lb.) was made by those receiving wet beet pulp, but the cheapest gains were produced on a mixture of ground corn, rolled barley, cut alfalfa hay, and salt. Of the silages made from green alfalfa, with potatoes, phosphoric acid, and no supplement, the largest average daily gain (0.33 lb.) was made with the potato-alfalfa hay silage. The average daily gains with the other supplements to the alfalfa silage were phosphoric acid 0.31, ground alfalfa alone 0.29, and alfalfa-corn silage 0.29 lb. The gains with the acid silage were most expensive. More economical gains than those with whole corn were produced with a grain mixture of ground corn, rolled barley, and dried beet pulp, fed with cut alfalfa hay and salt. More feed was required by lambs receiving sulfur to control enterotoxemia.

Studies on the metabolism of thiamine in swine, J. W. PENCE (*In Abstracts of Doctoral Dissertations*, 1944. *State Col.: Pa. State Col.*, 1945, vol. 7, pp. 5-10).—Lots of eight pigs each were fed three levels of thiamine and investigations were made of the thiamine content of the carcasses, employing the thiochrome procedure. The thiamine content of the pork was profoundly influenced by the thiamine intake. The carcasses from pigs which received 3.45 mg. of thiamine per pound of feed were approximately twice as high as in pigs which received only 1.23 mg. There was a still higher thiamine content of the muscle from pigs receiving 5.76 mg. of thiamine per pound of feed than from pork from pigs receiving smaller amounts of thiamine. The muscle tissue of the pigs contained up to 10 times as much thiamine as the muscle tissue of any other species of animals. Larger amounts of thiamine in the ration increased the thiamine content of the pork, but there were no greater amounts when the feeds contained over 30 mg. per pound. Pork loin

consistently contained from 20 to 25 percent more thiamine than pork shoulder. Pork liver showed less response than pork muscle to increased thiamine contents. When an increase of 2.5 times the intake caused an increase of 100 percent in the muscle thiamine, there was an increase of 40 to 50 percent in the liver thiamine. The thiamine content of tissues from pork carcasses of 19 pigs fed average rations were shoulder 36 mg. per pound of fresh lean tissue, loin 4.5 mg. per pound, and ham end of loin 4.7 mg. per pound of tissue.

In other experiments in which pigs were fed 50 mg. of thiamine daily for 2, 3, 4, and 5 weeks, the pork thiamine values increased rapidly and fairly regularly until a maximum storage level was attained in 35 days. Another group of pigs from which the extra thiamine was withdrawn after 35 days but continued for another 35 days on a normal ration showed that the muscle tissue of the pig displays a high affinity for thiamine, and the loss under this treatment was very slight. Pig blood from 18 animals on normal rations showed an average of 17 μ g. of thiamine per 100 cc. This is considerably higher than the amount found in human or rat blood.

Hogging-off crops in the Coastal Plain, B. L. SOUTHWELL and K. TREANOR. (Coop. U. S. D. A., Ga. Expt. Sta., et al.). (*Georgia Coastal Plain Sta. Bul. 41* (1945), pp. 66, illus. 17)—Results are presented of a series of tests beginning in 1936 to determine the amount of pork produced per acre by hogging-off various crops and the adequacy of the succession of crops. Small grain hogged-off during May and June produced an 8-yr. average of 306.3 lb. of pork per acre. In 3 yr. the average yield of pork per acre for oats hogged-off was 342.77 lb., for rye 318.38 lb., and for wheat 215.72 lb. When shelled corn was fed in addition to hogging-off of small grain, pigs put on an additional pound of gain for each 1.89 lb. of corn consumed. Early dent corn hogged-off from average dates of July 7 to August 29 produced an 8-yr. average of 501.63 lb. of pork per acre. The average for pork produced per acre by the different feeds hogged-off were corn and Spanish peanuts 541.72, Spanish peanuts alone 342.16, and Grohoma sorghum and Spanish peanuts 314.13 lb., corn and mature soybeans 305.2, runner peanuts 361.35, sweetpotatoes 457.42, and field corn 358.28 lb. The smallest returns per acre of crops hogged-down were from sunflowers.

[Contributions to poultry science] (*World's Poultry Sci. Jour.*, 1 (1945), Nos. 2, pp. 46-49, illus. 1; 3, pp. 82-85, 86-92, 94-99, 100-103, 104, illus. 6).—Continuing studies in several regions and countries of the world (E. S. R., 93, p. 481), the following brief articles dealing with poultry production and feeding and egg consumption are included:

No. 2.—The Poultry Industry in India, by A. E. Slater (pp. 46-51); Bringing International Poultry Statistics Up-To-Date, by M. A. Jull (p. 52) (Univ. Md.); Kitchen Scraps and Potatoes for European Flocks (pp. 53-56); The Poultry Industry of Chile, by L. A. Nervo (pp. 57-58); Relative Efficiency of Dairy Cows, Swine, and Poultry in Converting Feed Into Food, by H. J. Almquist (pp. 59-61) (Univ. Calif.); Poultry Conditions and Possibilities in South America, by A. K. Stewart (pp. 62-64); International Poultry Disease Control Measures, by M. A. Jull (p. 65) (Univ. Md.); The Poultry Industry in New Zealand, by J. H. Kissling (pp. 66-67); A Poultry Market in Korea (p. 68); Egyptian Baladi Incubation (p. 68); and Araucana Chickens in South America Before Discovery of America? (p. 69).

No. 3.—Changes in Spain's Poultry Industry in Last Decade, by S. Castello (pp. 82-83); Service of J. J. Jordaan to the Poultry Industry of South Africa, by M. A. Gericke (pp. 84-85); Recent Poultry Developments in Brazil, by J. R. Redditt (pp. 86-92); The Poultry Industry in Eire, by D. Philpott (pp. 94-97); Aviculture in the Republic of Argentina, by P. A. de Sarasqueta (pp. 98-99); How to Encourage Egg Consumption, by H. I. Huntington (pp. 100-103); and Egg Potato Pie (p. 104).

The sulfur balance of the non-laying, molting, and laying hen, R. T. HOLMAN, M. W. TAYLOR, and W. C. RUSSELL. (N. J. Expt. Stas.). (*Jour. Nutr.*, 29 (1945), No. 4, pp. 277-281, illus. 1).—A study of the loss or retention of sulfur in four hens was made during 4- and 12-day periods of molting and high and low egg production during 3 mo. The sulfur balance decreased with an increase in egg production, becoming negative in most cases when the production rate exceeded 50 percent, and also decreased during feather loss in molting and became negative with heavy feather loss. Sulfur in the droppings, calculated as percentage of that in the feed, remained high during high egg production and severe feather loss.

Studies of calcium and phosphorus metabolism in the chick.—III, Some time relationships in the action of vitamin D, E. W. MCCLESNEY and N. J. GIACOMINO (*Jour. Nutr.*, 29 (1945), No. 4, pp. 229-235).—Continuing this series (E. S. R., 92, p. 104), balance studies of Ca and P were investigated in 3 groups of 20 White Leghorn ♂ chicks each, and in a fourth group studies were made of 40 White Leghorn ♂ chicks of the metabolism of vitamin D₂. The baby chicks had a supply of vitamin D adequate for about 14 days of life. Feed and excretions were analyzed at about 3- to 4-day intervals for the 3 groups and the retention of Ca and P ascertained. A level of about 20 mg. of Ca and P was retained per 100 gm. of chick after the first week by those receiving no additional vitamin D. This retention was continued for about 3 weeks, after which there was a decline to very low levels. However, vitamin D₂ or D₃ furnished by a stomach pump brought improvement for 7 or 8 days, after which the chicks returned to low levels of retention. A second vitamin supplement produced a positive but smaller effect, probably due to the growth of the birds. The increased level of retention was directly related to the vitamin D available. Following an oral dose of 2,400 International Units of Vitamin D, the body content increased to about 1,000 I. U., and, in the ensuing 10 days, fell to about 250 I. U. The residue, equivalent to about 6 I. U. of vitamin D₂, was rather tenaciously conserved.

The use of soybean meal in the diet of growing chicks.—II, Effect of different grains, D. WHITSON, J. C. HAMMOND, H. W. TITUS, and H. R. BIRD. (U. S. D. A.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 408-416).—Continuing this series (E. S. R., 91, p. 63), wheat proved to be superior in most cases to corn, barley, oats, and milo, judging by the rapidity of growth when chicks were fed to 10 weeks of age on rations of a single grain, soybean meal, alfalfa leaf meal, butyl fermentation solubles, a source of vitamin D, and appropriate mineral supplements. However, variability was such that certain lots of wheat were no better than some lots of corn and barley. The sample of wheat giving the most rapid growth had been stored 6 yr. and was lower in protein content than most of the other grain samples. Thus protein content and age of storage were not the important factors in nutritive value of the grains. The factor or factors responsible for the superiority of wheat over corn was supplied by 3 percent sardine meal or 8 percent dried cow manure. Growth was significantly improved by additions to the corn ration of a combination of choline chloride, nicotinic acid, pyridoxine, inositol, and *p*-amino-benzoic acid in one experiment and choline chloride with nicotinic acid and bone meal in another. Supplements of these materials to a corn ration give results inferior to those produced on the wheat ration. On the basis of these results, it is concluded that none of the chemically characterized vitamins are primarily involved. An extensive bibliography on proteins from soybean meal and use of cow manure for chicks is given.

The use of dried incubator offal in chick rations, H. L. KEMPSTER. (Univ. Mo.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 396-398).—At levels of 3 and 6 percent of the rations of nearly half corn meal with wheat byproducts, alfalfa leaf meal, soybean meal, and meat scrap, dried incubator offal proved a satisfactory substitute

for portions of the meat scrap or soybean meal. For these comparisons 5 lots of nearly 30 White Leghorn chicks and equal numbers of New Hampshire chicks were brooded for 8 weeks. The feed consumption per chick and per pound of gain was recorded.

A comparison of the mortality of Single Comb White Leghorn growing pullets and laying hens, R. L. BRYANT. (Va. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 423-425).—Comparisons were made of mortality of the F_1 ♀ progeny of 264 breeding hens during growth and during the laying period. The mortality of these progeny in the growing and laying periods was related. Losses during the growing period were indicative of losses during the laying period. In all there were 3,542 ♀ chicks, of which 3,030 layers were housed.

Formalin fumigation of hatchers by the cheesecloth method, G. S. GODFREY, R. BUSS, and A. R. WINTER. (Ohio State Univ.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 417-422).—The bacteria per cubic foot of air were greater during hatching in separate hatchers than in incubator hatchers due to the greater number of eggs per cubic foot in the smaller units. Destruction of *Salmonella pullorum* was produced by 15 cc. of formalin per 100 cu. ft. of air space by the cheesecloth method. Fumigation in this way during hatching was satisfactory in four of five separate hatchers in which it was tested.

Gathering and storing hatching eggs during hot weather, B. W. HEWYANG. (U. S. D. A.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 434-437).—Study was made of how hatchability is affected during hot weather in eggs not gathered frequently and not stored in a cool place (E. S. R., 92, p. 38). The eggs of 102 pullets were collected in four different periods in which the maximum air temperature was 90°-94.9°, 95°-99.9°, 100°-104.9°, or 105°-109.9° F. The eggs were gathered each hour, twice daily, or once daily, and stored for not more than 7 days at 55° or in a cellar. Analyses of the hatchability of the eggs from different frequencies of gathering and differently stored were made by the application of the estimation of the statistic \bar{p} according to the methods of Hendricks (E. S. R., 74, p. 684). The results indicate that as far as hatchability is concerned it is not necessary to gather eggs oftener than once a day during the hot weather, but it is essential that they be stored in a cool place.

Calcium, phosphorus, and vitamin D interrelationships in turkey poult nutrition, R. J. EVANS and A. W. BRANT. (Wash. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 404-407).—An interrelationship between Ca, P, and vitamin D was observed in the rations of turkey poults within certain limits. Changing the level of any one of these appeared to change the requirement of the others for optimum growth and calcification. The higher the levels of vitamin D the smaller changes occurred in Ca and P. Under the other conditions, as little as 50 A. O. A. C. chick units of vitamin D per 100 gm. of the ration produced maximum growth and calcification on rations containing 2 or 3 percent Ca and 1 percent P. When the diet contained 160 units of vitamin D, 0.6 percent Ca and 0.6 percent P were sufficient. The levels of Ca and P seemed to have a greater influence than the Ca : P ratio, and the best results were obtained at P levels of 1 percent and Ca levels of 2 or 3 percent. This study was conducted with Broad Breasted Bronze turkey poults on a ration of ground wheat 17.2, ground oats 10, ground barley 10, mill run 20, fish meal 3.4, soybean meal 26.6, dehydrated alfalfa 7.5, riboflavin concentrate 1, and salt 1. Oystershell flour and a vitamin D oil furnished 1.36 percent Ca, 0.68 percent P, and vitamin D, and at the end of 1 week the poults were divided into 26 groups of 10 poults each to furnish various levels of these three ingredients. Determinations were made at weekly intervals up to 8 weeks of age of weights, total ash, and bone ash.

Sources of artificial light for turkey breeding females, T. T. MILBY and R. B. THOMPSON (*Poultry Sci.*, 24 (1945), No. 5, pp. 438-441, illus. 2).—Pens of 13

turkey hens each lighted by a gasoline lantern, a kerosene lantern, a natural gas light with clear glass globe, a natural gas light with frosted glass globe, or an electric light were compared with no light as sources for obtaining early eggs. Hens lighted with a gasoline lantern or a natural gas light showed essentially the same production characteristics as hens lighted with electric lights. Differences between the fertility and hatchability of eggs from turkeys lighted in the same pens were so great that no significance could be attached to advantages between pens. In a second experiment, 3 pens of 25 turkey hens and 2 toms each were employed to further study the lack of response to kerosene lanterns. The all-night lights used were kerosene lanterns and electric lights in comparison with no artificial lights. In good weather the birds had access to winter wheat pasture. In the 2 yr. the hens showed no responses to kerosene, and egg production was very low. The hatchability of fertile eggs in the second year was 71 percent in the kerosene-lighted pen, 59 percent with the electric lights, and 53 percent without lights. Because of the wide variations between turkeys, the differences in the production and hatchability of eggs produced made the results of little significance.

DAIRY FARMING—DAIRYING

Developing a profitable dairy herd, M. MOORE and E. M. GILDOW (*Seattle 1: Wood & Reber, 1945, pp. 192, about 80 illus.*).—A popular account of breeding, feeding, management, and diseases of dairy cattle.

Grazing time too short, D. M. SEATH and G. D. MILLER (*Dairy Res. Digest [Louisiana Sta.], 3 (1945), No. 3, pp. 1-2*).—Observations during August and September showed that cows averaged 2 hr. 18 min. in actual grazing away from shade, and 5 hr. 10 min. in the shade with little or no grazing. The cow's natural habit is to graze every 2 or 3 hr. and then retire and chew her cud. A feeding spot can preferably be located in the shade and near water and salt.

High humidity not harmful to cows, D. M. SEATH and G. D. MILLER (*Dairy Res. Digest [Louisiana Sta.], 3 (1945), No. 3, p. 1*).—An increase in the atmospheric temperature caused a sharp increase in the rate of breathing and in the cow's body temperature, with a less pronounced increase in the pulse. Changes in humidity had no appreciable effect on the respiration rate. These results are explained by the absence in the cow's body of sweat glands which prevent increase of temperature in man.

The preparation and biological effects of iodinated proteins, I-V (*Jour. Endocrinol., 4 (1945), No. 3, pp. 219-304, illus. 13*).—The following papers deal with the secretions of the thyroid and its relation to lactation:

I. *Introduction*, J. Barcroft (pp. 219-220).—A review is given of the work by several authors on the effects of iodinated proteins on thyroid activity and milk production of dairy cattle.

II. *Preparation and properties of physiologically active iodinated proteins*, R. [V.] Pitt Rivers and S. S. Randall (pp. 221-236).—Iodinated protein was prepared from ox plasma, Ardein (the commercial name for a mixed protein from ground nuts), and casein. The total iodine and acid-insoluble iodine contents were ascertained. The iodinated plasmas contained up to 1.5 percent iodine, Ardein preparation 1.4, and iodinated casein 2.8 percent acid-insoluble iodine. Iodinated products from these three protein sources were active in increasing milk secretion of cows and accelerated metamorphosis in tadpoles, as reported by Turner (E. S. R., 89, p. 435). Iodinated casein was satisfactory for preparation on a large scale, better yields were obtained than from other products, and it seemed to have the greatest biological activity.

III. *The effect of iodinated protein feeding on the lactating cow—(1) the effects of preparations of low activity and of iodinated Ardein*, K. L. Blaxter (pp. 237-

265).—Experiments with iodinated proteins of low thyroidal activity resulted in little effect on milk production or metabolism in dairy cattle, and symptoms of iodinism rapidly occurred when larger doses were given. Iodinated Ardein stimulated milk production considerably, and there was a concomitant increase in metabolism of individual cows. There was no permanent damage to cows in succeeding lactations, even from long-continued administration. The cows received up to 50 gm. per day, whereas the controls received the same amount of noniodinated protein. Increases in both milk production and fat percentages occurred when 50 gm. of iodinated Ardein was fed to four dairy cows, but there was little if any response when 10 gm. was fed. However, the differences may have been due to other circumstances. Marked changes in metabolism were noted in those receiving the 50-gm. doses. The results were similar to those produced by feeding dried thyroid or the injection of the pure hormone. The effect was not due to the additional protein alone in control cows. Similar results were obtained in a second experiment from iodinated treatments on the milk and fat production, physiological conditions, composition of the blood and milk, and rectal temperatures of the animals.

IV. *The effect of iodinated protein feeding on the lactating cow—(2) the effects of iodinated casein*, K. L. Blaxter (pp. 266-299).—Preparations of iodinated casein were fed to dairy cows to elucidate the factors responsible for the variation in the responses to iodinated protein feeding and the possibilities for the use of iodinated casein under practical conditions. The results with three preparations were in substantial agreement with results obtained with metamorphosis in tadpoles. Coating iodinated casein with solid stearic acid and variations in the basal ration were without effect on the potency. Both heifers and cows of the Guernsey and Short-horn breeds responded to treatments, but the stage of lactation was a factor. Response is related to yield of the individuals, which is in part affected by the stage of lactation. Symptoms of hypermetabolism were much more severe at higher dose levels than would be expected on directly proportional relationships. The optimal stimulation seemed to be in the region of about 20 percent. The galactopoietic potency of various samples of iodinated proteins is discussed.

V. *The effect on basal metabolism of milk from cows fed with iodinated protein*, J. D. Robertson (pp. 300-304).—A review of the thyroxin content of milk is followed by the results of a study which showed that the daily consumption by 27 nurses of 1 qt. of milk from cows fed iodinated protein caused no elevation in basal metabolism, pulse rate, or blood pressure. The caloric intake was thought to outweigh greatly the effect caused by any metabolic stimulant present in the milk, since there was a significant increase in weight. Milk from cows fed iodinated protein may contain thyroxin in excess of normal and may cause toxic symptoms in infants consuming it.

Preservation of fluid milk by concentrating and freezing, J. G. LEEDER (In *Abstracts of Doctoral Dissertations, 1944. State Col.: Pa. State Col., 1945, vol. 7, pp. 127-131*).—The preferable process for manufacturing frozen concentrated milk involved pasteurization at 180° F. for 15 min., concentration to about a 3 to 1 ratio, followed by homogenization at 3,000 lb. pressure. It is best when initially frozen in an ice cream freezer, packaged and immediately hardened, and stored at temperatures as low as -10°. Hot water was preferable to cold water for reconstitution, and the reconstituted milk was in some ways difficult to distinguish from fresh fluid homogenized milk.

Commercial composite milk sample technique, L. M. DORSEY. (Maine Expt. Sta.). (*Milk Dealer*, 34 (1945), No. 12, pp. 68-74).—General directions for taking and preserving composite milk samples and the Babcock testing procedure.

Factors affecting the quality of Texas butter as revealed by a Statewide survey, F. E. HANSON, W. S. ARBUCKLE, and C. N. SHEPARDSON (*Texas Sta. Bul.*

670 (1945), pp. 31, illus. 11).—A survey of 273 samples of Texas butter and the conditions under which it was produced showed the following values for constants: Hardness of the butterfat, 763 gm. (weight of Hg to effect a specified penetration in a penetrometer devised by the authors); slipping point of the butterfat, 35° C.; melting point of the butterfat, 35.7°; Reichert-Meissl number, 30.6; iodine absorption number, 31.8; saponification number, 226.2; percentage of soluble acids, 3.9; percentage of insoluble acids, 88.4; and the thiocyanogen number, 27.4. In comparison with butter produced in the Northern States, values greater than those generally given for normal butter were obtained in the hardness, slipping and melting points, Reichert-Meissl number, saponification number, and percent soluble acids. The iodine absorption and the thiocyanogen numbers were lower than normal, and the percentage of insoluble acids was approximately normal. Definite advantage in the manufacturing processes, in transportation, and in influencing consumer acceptance during the warm months were shown for the higher melting point of the butterfat produced in Texas. The survey offers a basis for further investigations of the specific effect of certain feeding, production, and manufacturing methods on maintaining and improving the marketing qualities of Texas butter.

Sweet potato flour—a good stabilizer for ice cream, A. J. GELFI, JR., and P. G. KENNEDY (*Dairy Res. Digest* [Louisiana Sta.], 3 (1945), No. 3, p. 2).—Continuing earlier work (E. S. R., 93, p. 492), ice cream mixes prepared with 0.5 to 1 percent sweetpotato flour exhibited superior whipping qualities, required no aging, and produced a very satisfactory body and texture with excellent melting-down properties as compared with ice cream mixes containing gelatin and no stabilizer.

VETERINARY MEDICINE

A suggestion concerning international veterinary relations, V. CHLADEK (*Vet. Rec.*, 57 (1945), No. 35, p. 407).—The author suggests the need for a permanent international veterinary institute which could, among other tasks, "prepare the international list of diseases of animals, suggest standard forms for statistical records, collect, catalog, and interchange scientific periodicals and other publications, and, finally, issue a complete veterinary bibliography."

Instituto de Investigaciones Veterinarias de Venezuela (*Caracas, Venezuela: Editorial Crisol*, 1945, pp. 51, illus. 18).—This publication, prepared for the Third Inter-American Conference of Agriculture, describes the institute and its work and discusses the status of its projects.

[Contributions to veterinary research from Australia] (*Austral. Vet. Jour.*, 21 (1945), No. 3, pp. 64-69, 73-74).—These contributions include The Field Control of Contagious Pleuro-pneumonia, by W. Webster (pp. 64-67); Strain 19 Vaccination Against Contagious Abortion—Preliminary Report on a Field Trial in Victoria, by R. J. de C. Talbot (pp. 67-68); Observations on the Use of Strain 19 Vaccine in the Field, by C. Pope (pp. 68-69); and An Acute Case of Parturient Haemoglobinaemia, by J. W. Rainey (pp. 73-74).

[Contributions from Onderstepoort] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 20 (1945), No. 2, pp. 123-158, illus. 26).—These include The Manufacture of Anti-Rinderpest Spleen Vaccine Under Field Conditions in Tanganyika Territory, by D. T. Mitchell and W. G. G. Peevie (pp. 123-135), and Immunization of Cattle Against Heartwater and the Control of the Tick-Borne Diseases, Redwater, Gallsickness, and Heartwater, by W. O. Neitz and R. A. Alexander (pp. 137-158).

Immunisation du cheval à l'aide du virus et de l'anavirus aphteux: Propriétés neutralisantes et préventives du sérum obtenu à l'égard de l'agent de la fièvre aphteuse [Immunization of the horse to the virus or attenuated virus of foot-

and-mouth disease; neutralizing and preventive properties of the serum], G. RAMON, E. LEMÉTAYER, P. MINGUET, and F. YEU (*Compt. Rend. Soc. Biol. [Paris]*, 138 (1944), No. 5-6, pp. 134-136).—Under the conditions of the experiment reported, it was found to be possible to prepare from the horse, either with the virus or attenuated virus, a serum possessing the power of neutralizing the foot-and-mouth disease virus and of protecting against it an animal as sensitive to the infection as the guinea pig.

Appréciation des propriétés "neutralisantes" spécifiques d'un sérum anti-aphteux obtenu chez le cheval: Nécessité de l'emploi d'un sérum étalon [Evaluation of the specific "neutralizing" powers of a serum for foot-and-mouth disease: Necessity of using a standardized serum], G. RAMON, E. LEMÉTAYER, E. LASFARGUES, and P. RAMON (*Compt. Rend. Soc. Biol. [Paris]*, 138 (1944), No. 5-6, pp. 162-163).—Tests with guinea pigs are described of a technic which permits, if a standardized serum obtained from the horse is used, the evaluation and measurement under satisfactory conditions of the neutralizing activity of various samples of this serum.

Détermination et évaluation, chez le cobaye, des propriétés préventives d'un sérum anti-aphteux préparé chez le cheval [Determination and evaluation with the guinea pig of the preventive powers of a serum for foot-and-mouth disease prepared from the horse], G. RAMON, E. LEMÉTAYER, E. LASFARGUES, and B. VIRAT (*Compt. Rend. Soc. Biol. [Paris]*, 138 (1944), No. 5-6, pp. 190-192).—Further tests with guinea pigs are reported.

Operation of an animal blood bank, R. E. EBRIGHT, F. HUNTER, and C. DONEY. (Wash. State Col.). (*Vet. Student*, 8 (1945), No. 1, pp. 9-12, illus. 1).—The operation of the animal blood bank and the technics employed in the College of Veterinary Medicine, State College of Washington, are described. A buffered sodium citrate-dextrose solution is used as a preservative. Canine blood can be stored 40 days, while bovine and equine blood can be stored for an average of 121 days. When the blood becomes outdated the plasma is still preserved and is useful if drawn off and stored as such.

Pharmacological studies on the uterus, F. ALEXANDER (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 2, pp. 140-145, illus. 5).—The isolated uteri of sheep, cows, and mares were studied pharmacologically, and findings as to the actions of adrenaline, acetylcholine, ergometrine, ergotoxine, and posterior pituitary extract are shown graphically and discussed.

Recetario veterinario para las principales enfermedades que atacan a todas las especies de los animales domesticos [Veterinary prescriptions for the principal diseases which attack all species of domestic animals], P. BORTOLETTI (*Guatemala: Tipog. "America,"* 1944, pp. 201).—Several hundred prescriptions are assembled.

Increased plasma fibrinogen induced by methylxanthines, J. B. FIELD, A. SVEINBJORNSSON, and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 525-528).—"The purpose of this report is to indicate that the administration of the methylxanthines in large single oral doses to the dog and rabbit raises the plasma fibrinogen level above the pre-test normal."

Studies with *Penicillium notatum* Westling in Hawaii, C. W. CARPENTER, D. M. WELLER, and J. P. MARTIN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 49 (1945), No. 1, pp. 1-23, illus. 14).—Following a review of work on the discovery, properties, and production of penicillin and its application in medicine, studies carried on by the station as a community and plantation service are reported. The prevailing temperature in Hawaii was found to be highly conducive to the growth of *P. notatum*, and means of increasing the yield and maintaining the penicillin-producing properties of the fungus are described. A new technic is also reported for preparing inoculated surgical gauze dressings. -

Clinical studies with crude penicillin, N. P. LARSEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 49 (1945), No. 1, pp. 25-30).—Reports are given on 10 type cases out of 100 studied.

A preliminary report on the production and use of crude penicillin solution in a naval dispensary, A. R. AGMAR (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 49 (1945), No. 1, pp. 31-40, illus. 3).—This article discusses the preparation and use of crude penicillin solutions and surgical gauze dressings, primarily for plantation use, stating that "they satisfy the need for penicillin in cases for which pure penicillin is not obtainable."

Preparation of penicillin and its veterinary application—preliminary experiments, Z. MORCOS (*Vet. Rec.*, 57 (1945), No. 37, p. 425).—In experiments at the Cairo Veterinary College, penicillin had no effect on rinderpest virus in calves, fowl plague, or fowl spirochetosis. It seemed almost specific in the treatment of strangles in horses, and promising in combating an epizootic types of pneumonia in sheep.

Observations on the use of penicillin in the treatment of bovine mastitis, C. A. V. BARKER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 9, pp. 235-243).—The infusion of 100 cc. of sterile distilled water-sodium penicillin solution into each of 32 quarters of 15 lactating cows, diagnosed as infected with mastitis streptococci on the basis of a modified Hotis test, resulted in a noninfected classification of only 16 quarters 1 mo. after treatment. In some instances swelling and hardness of the treated quarters were produced, with thick clots of milk for a short period following treatment and a slight rise in temperature. One case showed slight anorexia. These reactions were of a transient type and apparently not followed by any serious changes in the secretory capacity of the udder. It is suggested that some of these reactions may have been caused by the presence of pyrogens in the infused solution.

The observations reported indicated that the optimum dosage and frequency have not yet been established, and that a satisfactory method of treatment and dosage for cows milked thrice daily must be worked out. However, it is stated that "at the present time the intramammary infusion of the potent antibiotic penicillin, in the form of sodium penicillin, appears to offer a method for the treatment of bovine mastitis producing results much superior to those obtainable with any other products previously available."

Effect of route of administration on detoxication of selenium by arsenic, A. L. MOXON, C. R. PAYNTER, and A. W. HALVERSON (S. Dak. Expt. Sta.). (*Jour. Pharmacol. and Expt. Ther.*, 84 (1945), No. 2, pp. 115-119, illus. 1).—In feeding experiments with rats in which sodium selenite and sodium arsenite were given orally and subcutaneously, the detoxication action of the arsenic was found to be independent of the mode of administration of either the selenium or the arsenic. It is thought that this finding "would not substantiate the theory that the arsenic acts by inhibiting the absorption of selenium from the gastrointestinal tract."

Tests of the safety of phenothiazine for cattle, G. E. CAUTHEN. (U. S. D. A.) (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 821, pp. 71-72).—Tests were carried on at the Regional Animal Disease Research Laboratory with 14 calves on ground grain and alfalfa hay and 2 calves receiving ground white corn and Johnson grass hay. The daily doses of phenothiazine ranged from 8 to 250 gm. and the days dosed from 1 to 56. The only indication of toxic effects was in a calf 7.5 mo. old on a single dose of 250 gm., and this appeared normal on the third day.

A phenothiazine trial in calves: An investigation into the possible toxicity of phenothiazine for calves, with observations on an unexpected outbreak of

acute parasitic gastro-enteritis, J. W. BRUFORD and I. H. FINCHAM (*Vet. Rec.*, 57 (1945), No. 37, pp. 421-424).—In a trial planned to demonstrate under normal farm management the beneficial action or toxicity of phenothiazine for yearling calves, varying doses of 40 to 100 gm. were given to 40 calves, with no untoward effects. Certain concurrent conditions of management, nutrition, and weather gave rise to a severe and acute parasitic gastroenteritis, and this was not prevented by dosing with phenothiazine. Fecal egg counts failed to indicate heavy infestations, which were only revealed by post-mortem worm counts. Variations in individual susceptibility were found, and the dosed calves eventually progressed better than the controls, as judged by eye and by their weight gains.

Glucose tolerance in the bovine, F. R. BELL and E. R. JONES (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 2, pp. 117-124, illus. 3).—Results of glucose tolerance tests on adult bovines by oral, subcutaneous, and intravenous routes were compared. The maximum glycosuria produced was 57 percent of sugar, and the maximum duration of glycosuria 94 min.

Infection of the bovine lungs with an organism resembling *Bacillus actinoides*, F. BLAKEMORE (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 2, pp. 132-139).—An organism which in many respects resembles *B. actinoides* was recovered from two outbreaks of bovine bronchopneumonia. The disease was reproduced experimentally in calves without difficulty by the intranasal injection of early cultures, but after further subcultivation the organism lost its pathogenicity, perhaps as a result of some modification of the organism when grown under artificial conditions. An account is given of the cultural characters of the organism as compared with *B. actinoides* and *Streptobacillus moniliformis*.

Bovine congenital goitre, S. JAMIESON, B. W. SIMPSON, and J. B. RUSSELL (*Vet. Rec.*, 57 (1945), No. 38, pp. 429-431, illus. 4).—Although bovine goiter had apparently not previously been reported from Scotland, its presence in newborn Ayrshire calves in Morayshire was noted. The condition appeared to be amenable to iodine therapy.

Vaccination against Johne's disease, T. M. DOYLE (*Vet. Rec.*, 57 (1945), No. 33, pp. 385-387).—Experiments with cattle and goats variously inoculated are reported which substantiate the conclusion of Vallee et al. (*E. S. R.*, 72, p. 839) that the subcutaneous inoculation of living Johne's bacilli is a safe procedure. "The vaccine devised by Vallee and Rinjard [*E. S. R.*, 57, p. 874] . . . merits a trial . . . on heavily infected herds in which the usual measures of control have failed."

Studies on the haematology of sheep.—IV, Erythrocytic and thrombocytic pictures, and variations in the physical attributes, H. H. HOLMAN (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 2, pp. 146-157).—This article deals with the anemias of sheep, including data for various physical attributes of the blood of sheep suffering from a variety of related conditions.

Hypocalcaemia in ewes, D. W. P. BYTHELL and W. H. PARKER (*Vet. Rec.*, 57 (1945), No. 38, pp. 432-433).—Two outbreaks apparently associated with a change of grazing are described.

Studies on the alimentary tract of Merino sheep in South Africa.—XIII, The rôle of prussic acid in the aetiology of acute bloat, R. CLARK and J. I. QUINN (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 20 (1945), No. 2, pp. 209-212).—Continuing this series (*E. S. R.*, 91, p. 469), the authors studied the ruminal movements in four Merino sheep with permanent ruminal fistulas following the introduction into the rumen of repeated small doses of potassium cyanide. It was found that more than four times the amount of KCN was required to cause ruminal paralysis during active fermentation of alfalfa in the forestomach than after a fast of 14 hr. This increased tolerance after feeding is explained on the basis of an accelerated elimination of HCN from the lungs resulting from the greater res-

piratory exchange, which in turn is caused by the absorption of CO_2 from the alimentary tract during fermentation. Similar results followed the artificial introduction of CO_2 into the rumen.

Sheep showing paralysis of the rumen caused by KCN were able to eructate 2 l. of gas per minute introduced through the ruminal fistula, thus affording direct evidence that eructation can take place independently of ruminal activity. It is considered that these observations "afford no evidence for incriminating the cyanogenetic factors in plants as being associated with the etiology of acute bloat in ruminants." Contrary to the theory of Cole et al. (E. S. R., 87, p. 413), "it would not appear that the absence of roughage necessarily leads to ruminal stasis, at least in the sheep, but even if this were the case the retention of ruminal gases would not be an inevitable sequence. It is more likely that the roughage acts in a mechanical way on the texture of the ruminal contents by preventing the formation of a frothy glutinous mass and allowing the gas to escape from the ingesta."

Eggs of *Fasciola hepatica* in an unusual situation, K. C. SUMNER (*Vet. Jour.*, 101 (1945), No. 8, pp. 181-184, illus. 3).—Eggs of this parasite were found in the diaphragm of a sheep. The manner of entrance is discussed.

The relation of antibody response in swine to dose of the swine influenza virus inactivated with formalin and with ultraviolet light, I. W. McLEAN, JR., D. BEARD, A. R. TAYLOR, D. G. SHARP, and J. W. BEARD (*Jour. Immunol.*, 51 (1945), No. 2, pp. 65-99, illus. 22).—The principal purpose of this study was to determine the relation of virus mass in influenza vaccines to the level of antibody titer induced in the vaccinated host. This is a factor of recognized importance in the induction of a state of resistance to infection. The strain of swine influenza virus used was that previously described by Taylor et al. (E. S. R., 91, p. 746). The results are thought to be of major significance in their bearing on the problem of the protection of man against infection with the influenza virus. The possibility is seen of grading the dose of vaccine to optional proportions relative to (1) response, (2) the toxicity of the vaccine, and (3) the cost of producing the vaccine. It is regarded as clear that "repetition of vaccination provides a far greater promise of maintaining a high antibody level through the influenza season than the application of a single injection of the largest dose of vaccine thus far investigated."

A comparison of oil of chenopodium, phenothiazine, and sodium fluoride as anthelmintics for swine, F. D. ENZIE, R. T. HABERMANN, and A. O. FOSTER (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 821, pp. 57-66).—This article reviews the literature (34 references) on these materials as anthelmintics for swine, and presents results of limited tests by the authors. In these tests, oil of chenopodium removed 86 percent of 100 ascarids from 20 pigs but was comparatively ineffective against other intestinal helminths. Several pigs vomited after treatment and 1 died. Phenothiazine removed less than 1 percent of 390 ascarids (somewhat less than anticipated) from 20 pigs, but apparently was quite effective against nodular worms. The drug was well tolerated, red-stained urine being the only host reaction. Sodium fluoride removed 100 percent of 23 ascarids from 26 pigs, but its action against other intestinal helminths was not determined. One or 2 pigs vomited after treatment and 1 died.

It is concluded from the survey of available data that "oil of chenopodium is more effective than phenothiazine against large roundworms, and its ascaricidal action is more uniformly reliable. Phenothiazine, however, is more easily administered and has the advantage of effective action against nodular worms. With respect to toxicity, both phenothiazine and oil of chenopodium have given rise to instances of intoxication and death, young pigs being more susceptible than older ones to intoxication with phenothiazine. In limited trials, sodium fluoride demonstrated a significantly superior ascaricidal action in pigs, was as well tolerated

as either of the above-mentioned drugs, and was easy to administer. Much more extensive testing will be necessary, however, before the safety and anthelmintic value of sodium fluoride can be properly evaluated."

Big head of horses in El Salvador, R. L. SQUIBB (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 821, pp. 84-89, illus. 4).—This nutritional disease was observed in horses in El Salvador in 1943. Incidences as high as 40 percent are reported, and these were successfully treated with shark-liver oil. Absence of night blindness was noted, although characteristic of the vitamin A deficiency described by Howell et al. (*E. S. R.*, 85, p. 112). See also a note by Kintner and Holt (*E. S. R.*, 68, p. 533).

Histological evidence indicating that a form of equine encephalomyelitis occurs in Palestine, I. H. PATTISON (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 2, pp. 109-116, illus. 4).—Histological findings in the central nervous system of three horses and three mules with symptoms clinically resembling equine encephalomyelitis indicated that a form of this disease occurs in Palestine. This form seems to resemble the type found in India but differs from that in the United States and from Borna disease.

The reaction of the reticulo-endothelial system in experimental brucellosis of dogs, G. MARGOLIS, W. D. FORBUS, and G. P. KERBY (*Amer. Jour. Pathol.*, 21 (1945), No. 4, pp. 753-777, illus. 10).—This paper describes the pathological findings in a group of dogs in which infection by a strain of *Brucella suis* was maintained as long as 487 days by repeated inoculations. The course of the disease was progressive only so long as inoculations were continued, and it was not possible to produce the clinical disease in dogs by repeated intraperitoneal injections with strains obtained from either a case of Hodgkin's disease or from a naturally infected dog. However, dogs repeatedly inoculated either intravenously or intraperitoneally and without clinical disease may harbor virulent brucella in the tissues of the reticulo-endothelial system for as long as 7 mo. after the inoculations are discontinued.

Sixth annual report of the Regional Poultry Research Laboratory, East Lansing, Michigan, July 1, 1944, to June 30, 1945 (*U. S. Dept. Agr., Bur. Anim. Indus.*, [1945], pp. 25+).—This report continues previous work (*E. S. R.*, 92, p. 567), and again deals largely with studies on lymphomatosis. Further experiments confirmed previous findings that lymphomatosis is spread by contact when young chickens from susceptible parental stock which has remained free of any clinical manifestation of the disease for more than 3 yr. are brooded with infected stock. Other experiments demonstrated that the neoplastic cells of tumors occurring in lymphomatosis, when implanted in young chicks, will induce typical lymphoid tumors which are both grossly and microscopically similar to the tumors providing the original inoculum. Chickens surviving implants of a lymphoid tumor appeared to be immune to subsequent reimplantations of the same tumor strain, and chickens proved to be immune to the lymphoid tumor by repeated implantations developed a high incidence of lymphomatous tumor of the visceral organs after a relatively long incubation period. Neither sulfathiazole or sulfamerazine had a preventive or curative effect on the transplantable lymphoid tumors with which the chickens were inoculated. Attempts to develop chickens resistant to lymphomatosis warranted the conclusion that this practice is well founded and valid.

Incidental studies on the influence of feed on eye color, diallel crossing on weight and hatchability of eggs, inbreeding on sexual maturity, and the cause of orbital deformity in the chicken are also noted, together with findings on cooperative projects.

The incidence of lymphomatosis among male and female chickens, B. R. BURMESTER (*U. S. D. A.*). (*Poultry Sci.*, 24 (1945), No. 5, pp. 469-472, illus. 1).—

A study of the first population of White Leghorn chickens raised at the U. S. Regional Poultry Research Laboratory, East Lansing, Mich., is reported. The chickens were derived from eggs obtained in 1939 from nine different breeders in eight widely scattered States. Upon hatching about one-half of the chicks were placed in a control group and maintained in strict quarantine throughout their lives. Two-thirds of the remaining chicks were inoculated at less than 3 weeks of age with heparinized whole blood obtained from birds showing clinical and gross necropsy manifestations of lymphomatosis and confined in contact with the remaining chicks in quarantined houses.

An analysis based on mortalities during the first 300-day period is presented. It was found that the incidence of lymphomatosis in noninoculated control and contact females was about twice that in noninoculated males, and indicates that the female is more susceptible. Differences between the sexes in inoculated birds were insignificant.

Plasmodium gallinaceum, a malarial parasite of the domestic fowl, M. CRAWFORD (*Vet. Rec.*, 57 (1945), No. 34, pp. 395-396).—Reference is made in this contribution from Ceylon to the studies of Brumpt (E. S. R., 78, p. 832). The geographical distribution of the disease is thought to be restricted to Indo-China, Sumatra, Ceylon, and probably India, and in Ceylon outbreaks have been in poultry yards where fowls have been imported from Great Britain. The incidence of the accompanying paralysis was found to be very much lower in naturally infected birds than in young chicks infected experimentally in the laboratory. Aside from its pathogenicity for domestic fowls, the parasite has proved of great value as experimental material for research on human malaria.

Infected egg shells as a means of spread of salmonellosis in chicks and ducklings—a preliminary note, J. E. WILSON (*Vet. Rec.*, 57 (1945), No. 36, pp. 411-413).—An outbreak in young chicks with a mortality as high as 36 percent is described. *Salmonella thompson* was isolated from the shells, yolk, and albumen of hens' eggs and the shell of a duck egg, and *S. aertrycke* from the shells of hens' eggs. Bacterial examination of cloacal swabs showed fecal contamination to be a probable source of infection, and disinfection, fumigation, and other sanitary measures are discussed as remedies. The setting of contaminated eggs was shown to be a means of spreading the disease in the incubator.

It is suggested that the presence of these *Salmonellas* on eggshells may be a method of infection in cases of food poisoning in man.

Staphylococcosis in geese, W. T. ROWLANDS and H. W. SMITH (*Jour. Compar. Pathol. and Ther.*, 55 (1945), No. 2, pp. 125-131).—A disease of young geese is described from North Wales as probably identical with the form reported as occurring in Continental Europe. This disease assumes an acute form with death in 2 to 3 days, but more commonly a chronic form with recovery or subsequent relapse and death. The acute form is septicemic in character, with some localization of infection in several limb joints, mainly of the legs. Diarrhoea is a constant feature. In the chronic form infection is localized in the joints, with marked emaciation, lameness, and diarrhoea.

The pathology is fully described, and emphasis is placed on the presence of black scabs on the under surface of the web, which, it is thought, constitute the primary lesions and the portal of entry of infection. A staphylococcus was isolated which is regarded as pathogenic on the basis of the coagulase tests and as having some degree of specificity. It produced no hemolysis on 10 percent sheep, hen, and goose blood agar, no filtrable hemolysin, and no demonstrable toxin. Autogenous vaccination was valueless prophylactically and therapeutically, and even appeared to precipitate an early and fatal termination of chronic cases. Sulfadiazine was without bacteriostatic effect in vitro, but penicillin was definitely bacteriostatic.

Incidence of turkey disease: A study of diagnostic records, K. L. BULLIS. (Mass. State Col.). (*Vet. Student*, 8 (1945), No. 1, pp. 32-33).—During the 10-yr. period 1935-44, 2,547 turkeys in 483 consignments were examined. The diagnoses are listed with the percentage of total diagnoses. Enterohepatitis, coccidiosis, and paratyphoid were most frequently found.

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1943.—Parts 6, 12 (U. S. Geol. Survey, Water-Supply Papers 976 (1945), pp. 470+, illus. 1; 982, pp. 257+).—These papers record measurements of stage and flow made on streams, lakes, and reservoirs for the year ended September 30, 1943, No. 976 covering the Missouri River Basin, and No. 982 the Pacific slope basins in Washington and upper Columbia River Basin.

Groundwater studies [in Arizona] (Arizona Sta. Rpt. 1944, pp. 20-24).—A report of groundwater studies made for the upper Santa Cruz Valley area, the Contaro-Marana district, the Eloy district, and the Little Chino Valley area are reported, together with investigations and recommendations for improvement of the water supply for Prescott and the State Industrial School at Fort Grant.

Water levels and artesian pressure in observation wells in the United States in 1943.—Part 2, Southeastern States, O. E. MEINZER, L. K. WENZEL, ET AL. (U. S. Geol. Survey, Water-Supply Paper 987 (1945), pp. 191+, illus. 12).—This paper records water levels and artesian pressures in observation wells in the Southeastern States for the year 1943. For wells not previously reported complete records are given, including those for the years before 1943, while for wells whose previous records have been published this volume records only the current year.

Improving the distribution of water to farmers by use of the Parshall measuring flume, R. L. PARSHALL. (Coop. U. S. D. A.). (Colorado Sta. Bul. 488 (1945), pp. 54, illus. 20).—To encourage the betterment of delivery of water to the farm and to parcel out equitably the common water supply throughout the entire irrigation system so that a closer relationship exists between the assessment paid and the return from crop production, the author presents improved methods of measuring discharge of small streams from canals and ditches into the lateral systems of farm fields. The Parshall measuring flume is described, and construction details are given for its installation and use. Quick calculating tables to be used in conjunction with water depth measurements taken in the stilling wells of the flume are given to determine quantity of water delivered.

First aid for the irrigator, I. D. WOOD (U. S. Dept. Agr., Farm Security Admin., 1945, pp. 37+, illus. 34).—A practical pictorial handbook for the irrigation operator, presenting methods of water application, field structures and equipment, pumping plant installations, piping, and power requirements.

Hydrologic design of farm ponds and rates of runoff for design of conservation structures in the Claypan Prairies, D. B. KRIMGOLD and N. E. MINSHALL. (Coop. Ill., Okla., and Mo. Expt. Stas.). (U. S. Dept. Agr., Soil Conserv. Serv., 1945, SCS-TP-56, pp. 27+, illus. 6).—A report in two parts: (1) Hydrologic design of farm ponds with quantitative relations presented in the form of equations and formulas and (2) rates of runoff for use in the design of conservation structures on small agricultural areas. While no information is included on the structural design and hydraulic characteristics of grassed channels, terraces, spillways, and other structures for disposal of excess runoff, references are given to published reports of the Soil Conservation Service and to other publications dealing with these subjects.

Weather resistant masonry, C. H. BACH (*Rev. Soc. Residential Appraisers*, 11 (1945), No. 7, pp. 6-9, illus. 4).—The author reports the findings of a survey of 200 masonry homes that had been subjected to severe rainfall and driving wind. Points of most noticeable failures were: (1) Around door and window frames, (2) at juncture of exterior wall with foundation at grade level, and (3) at top of exterior footing or basement floor level. Generally all trouble spots occurred where different materials met, or where similar materials were separated by an open joint. Some practical construction points are also presented, including specifications for standard mortar mix proportions.

Vapor adsorption: Industrial applications and competing processes, E. LEDOUX (*Brooklyn, N. Y.: Chemical Pub. Co., 1945, pp. 360+, illus. 145*).—In this compilation of the theories of numerous investigators and writers on adsorption, the author has made a serious attempt at an accumulation of most published work cognate to the subject. The book is divided in four parts, with four appendixes.

Part 1, Static Adsorption, does not have as its objective the making of an extensive survey of the laboratory results obtained by different investigators throughout the world, as has been done by McBain,⁴ but has the purpose of giving as clear a picture as possible of this complex phenomenon. This part is subdivided into five chapters, namely: (1) The adsorption equilibrium, (2) effects of an external force applied to the liquid or solid phases, (3) adsorption potential and properties of the adsorbate, (4) heat of adsorption, and (5) capillary adsorption.

In part 2, the essentials of vapor and heat transfer and the saturation of air are discussed in four chapters, namely: (1) Definitions, (2) heat transfer and heating efficiency, (3) vapor transfer and saturation efficiency, and (4) adiabatic saturation.

In part 3 dynamic adsorption is briefly dealt with. It shows how much there remains to be investigated and to what extent attention has been concentrated on static adsorption in the past. Presentation is given in four chapters, namely: (1) Isothermal desorption, (2) isothermal adsorption, (3) adiabatic adsorption, and (4) adiabatic desorption.

In part 4 some of the more outstanding, broad problems, for whose solution adsorption has proved to be the most successful, are examined. This part is subdivided into 11 chapters, namely: (1) Industrial applications of static adsorption; (2) dehumidification by condensation; (3) dehydration by adsorption; (4) dehumidification by adsorption; (5) air conditioning; (6) conditioning of underground spaces; (7) drying of hygroscopic material; (8) forced-draft, low-temperature drying; (9) dehydration of compressed gases; (10) drying of optical instruments; and (11) vapor recovery.

In the appendixes four mathematical developments are presented: (1) Heat of vaporization under pressure π in the case of an imperfect vapor, (2) equal molal diffusion at constant pressure, (3) desorption at low mass velocities, and (4) evaporation from porous slabs.

Tractor repair and maintenance, R. I. SHAWL. (Coop. U. S. D. A.). (*Ill. Agr. Col. Ext. Cir. 589* (1945), pp. 70+, illus. 49).—This circular which is a revision of Circular 499 (E. S. R., 82, p. 830) tells what to look for when checking the parts of tractors to determine whether they are in proper working order, and gives detailed directions for their adjustment and repair. The subject matter is broken down into the following subdivisions for easy reference: (1) Repair and maintenance check list, (2) tractor engine, (3) fuel system and carburetor, (4) the ignition system, (5) the cooling system, (6) front wheels and steering gear, (7) transmission and rear wheels, (8) lubrication, (9) tractor fuels, (10) tractor operation, (11) storing the tractor, (12) removing tractor from storage, and (13) index.

⁴ The sorption of gases and vapours by solids, J. W. McBain. London: George Routledge & Sons, 1932, pp. 577+, illus. 151.

The Tennessee liquid fertilizer distributor, M. A. SHARP (*Tennessee Sta. Cir. 87 (1944), pp. 8, illus. 8*).—A detailed description with photographs of the apparatus, a positive displacement, multiple-unit pump mounted on a trailer. Instructions for construction of the pump, delivery pipes, and trailer, together with over-all adjustments and operating directions, are given.

A laboratory huller for sunflower seed and oats, H. R. SALLANS and G. D. SINCLAIR (*Canad. Jour. Res., 23 (1945), No. 5, Sect. F. pp. 306-312, illus. 4*).—A laboratory hulling unit of the centrifugal impact type is described. Test data of its performance on sunflower and oat seeds are given using percentage of seed hulled and meats broken as criteria of efficiency. Since hulling efficiency is a function of impact velocity and moisture content of the seed, selection of proper operating conditions resulted in efficiencies of 90 to 95 percent hulling with less than 10 percent broken meats.

A small separator for the recovery of milkweed floss and seed.—I, Construction and operation, D. H. HAMLY (*Canad. Jour. Res., 23 (1945), No. 5, Sect. F, pp. 313-325, illus. 7*).—The author describes the construction, operation, and performance of a small designed separator. Capacity of the test machine was 12 bu. of dried pods per hour with yields of 83 to 92 percent high grade floss and 95 to 98 percent seed recoveries. Using data collected from the experimental model a larger portable continuous production model with a capacity of 20 bu. per hour has been constructed occupying a floor space of 9 by 5 ft., as does the original test machine.

A study of electric chick brooders (*[New York] Cornell Sta. Rpt. 1944, pp. 91-92*).—Experimental data indicate that for the 4-ft.-square brooder, four 125- to 150-w. lamps, one on each of the four sides, 18 in. from the floor and set to point downward 15° to 20° from the horizontal give better results than do two 250-w. lamps on opposite sides of the brooder. A saving of up to 22 percent of electrical energy can be effected by thermostatic control of two of the four lamps. Results of tests made of three types of lamps—reflector heat, reflector flood, and reflector drying—indicate that the reflector heat lamps gave best results, for under similar brooding and feeding conditions chicks gained 15 lb. per 100 birds more than did birds under the other lamps. Also these chicks were judged much superior to the others.

Exposure tests for farm fencing (*[New York] Cornell Sta. Rpt. 1944, p. 91*).—Tests begun in 1936 showed that after 6 years' exposure wire samples having galvanizing weights of from 0.25 to 0.27 oz. per square foot surface were nearly completely covered with rust, 0.28- and 0.29-oz. samples were 57 and 53 percent rusty, while 0.30-oz. samples were only 15 percent rusty. These test records indicate that caution should be exercised before purchases of surplus stocks of war fencing are made, as it is practically certain that such surplus stock wire will be completely rusted over in 3 yr. or less after erection.

Effect of temperature on viscosity of procoating paint, E. H. WIEGAND and C. J. WILDER. (*Oreg. Expt. Sta.*). (*Food Packer, 26 (1945), No. 9, pp. 50, 52, illus. 1*).—Using a paint consistency of 50 parts paint with 50 parts thinner applied to tin test pieces under varied conditions of temperature to determine the effect on viscosity and weight and thickness of the dried film the authors report that: (1) The weight and thickness of the dried film increased when the temperature of both tin and paint or either one was lowered, (2) the temperature of the tin influenced the thickness and weight of the dried film more than the temperature of the paint at the time of application, and (3) low temperatures result in a thicker paint (higher viscosity), which agrees with the findings regarding weight and thickness of the dried film.

Convertible farm buildings, N. H. CURRY and H. GIESE. (*Iowa Expt. Sta.*). (*Agr. Engin., 26 (1945), No. 9, pp. 356-361, illus. 7*).—The authors report on a

study of the unit-space modular method in planning flexible farm structures. Proposed increments for space enclosures for common types of stalls and pens are multiples of rectangular solids 3 by 4 ft. in plan and 8 ft. in height. Fabrication of a system of barn equipment adapted to fit together to enclose these space units provides an unlimited number of combinations which can be assembled from a few basic units. Seven basic units comprising barn equipment are illustrated, and their combinations are shown forming feed bunkers and mangers, horse stalls or box stalls, farrowing pens for hogs (pens for other animals are similarly assembled), and dairy cow stalls. It is pointed out that no major deviations from conventional building practices are required in buildings adapted to the unit equipment system, and those requirements are summarized as follows: (1) The building must have a dead level floor and ceiling with ceiling height closely approximating 8 ft., (2) interior bay areas must be divisible into rectangles nominally 3×4 ft., (3) no posts or other obstructions can occur between sidewalls and fixed central alleys, (4) post spacing lengthwise of the building must be some multiple of 4 ft., (5) provision for attachment of panels to concrete floors should be made at the time of building construction, and (6) end-wall construction must be such as to permit rather easy relocation of doors to match possible relocation of alleys. The potential advantage of such a system lies in its adaptability to fit day-to-day changes in housing requirements. Panels are secured in place with only 4 bolts per panel. The development of quick-acting, non-corrosive items of hardware to fit the panels would reduce the time required for making plan alterations to a few minutes per stall or pen. Since all panels have built-in hinges they are in effect gates rather than fixed panels. Without removing panels, all equipment except bunkers or mangers may be swung against walls or ceiling and the floor space made clear to permit rapid mechanical cleaning or temporary use of the space for some entirely different purpose. Reduction in the total space enclosure required for one farm should also be possible. Instead of providing housing accommodations for each of the varied operations performed throughout the year, it is necessary to enclose only enough space to meet the requirements at the time of peak occupancy.

The design of barns to withstand wind loads, F. C. FENTON and C. K. OTIS (*Kans. Engin. Expt. Sta. Bul. 42 (1941), pp. 76, illus. 43*).—The authors report the results of an investigation of the loads imposed on the more common shapes of barn roofs by winds of different velocities and the design of practical barn framing with an adequate factor of safety to withstand these loads. The subject matter of the overall problem is presented in detail under the following main headings: (1) The theory of wind pressures on barns, (2) wind tunnel investigations, (3) design loads for barn frames, (4) design of barn frames for wind resistance, (5) results of barn framing tests, (6) framing details for wind-resistant construction, (7) wooden joint construction, (8) split-ring connectors, (9) toothed-ring connectors, (10) shear-pin joints, and (11) glued joints.

Forced ventilation hay driers, R. G. CONNELLY. (Va. A. and M. Col.). (*Jersey Bul., 64 (1945), No. 10, pp. 652-653, 708*).—Experience in Virginia is cited which proves mow drying to be satisfactory. The forced ventilation system to complete curing of field-wilted hay forces large volumes of air under low pressure up through even layers of hay spread over a simple system of ducts installed on the mow floor. Since the duct system must give a uniform distribution of air to the hay placed upon it, each system must be engineered to meet the particular mow. Four basic considerations must be kept in mind when a hay drier is contemplated, namely: (1) If the air released through the duct system is to be forced up through the hay the mow floor must be airtight; (2) the mow must be well ventilated to permit the moisture-laden air to escape easily from the hay to the outside of the mow; (3) without a good roof over the mow rain leakage may spoil the hay once it has

been mow-cured; and (4) wilted hay is heavy, therefore dependable hay handling equipment is important. Cost of installation and operation varies with size of drier and power rates. However, on an average, installation will range from 30 to 40 ct. per square foot of mow floor and operation from 32 to 96 kw.-hr. per ton of hay. The following advantages in the use of mow hay driers are given: (1) The risk of weather damage is greatly reduced; (2) practically all the leaves and green color of the hay crop can be conserved; (3) the hay is more palatable than field-cured hay; (4) mow-cured alfalfa hay may increase milk production as much as 14 percent; (5) it is possible to maintain high levels of milk production on reduced protein in the grain rations; (6) maximum use is made of the principles involved in the production of quality forage crops, soil conservation, and livestock nutrition; (7) mow storage capacity is increased at least 50 percent because wilted hay packs tighter; (8) with legume hay, a good dairy ration can be provided with a grain supplement composed of home-grown corn, barley, oats, and wheat and a limited amount of wheat bran; (9) usually no more labor is required in making hay; and (10) mow cured hay enables the dairyman to save in grain feed costs yet maintain relatively high levels of milk production in the herd.

Resistance of hay to air flow, A. T. HENDRIX. (U. S. D. A. coop. Va. Expt. Sta.). (*Agr. Engin.*, 26 (1945), No. 9, pp. 369-371, illus. 5).—The author presents data and information obtained in studies of air flow through hay and the static pressure necessary to effect this flow made in an experimental installation for drying hay comparable in size to that of actual barn storage. Results obtained indicate that: (1) For a given static pressure the volume of air flow is reduced approximately one-half for each 3-ft. increase in hay depth above 6 ft.; (2) the static pressure required to effect a given volume of air flow is more than doubled for each 3-ft. increase in hay depth above 6 ft.; (3) to effect equal hay-drying rate, the volume of air supplied (and consequently the static pressure required) must be increased at a greater rate than increase in hay depth; (4) the resistance of hay to flow of air is not constant, for as drying proceeds the hay depth is reduced due to settling, decreasing the resistance of air flow (for example, 12 ft. of green alfalfa hay when cured to a safe storage moisture content of 20 percent, measured only 8½ ft.); (5) uniformity of air flow through the hay mass is very difficult to effect, and care should be taken in placing the hay in the mow so that reasonably good distribution will result; and (6) caution should be exercised as to the depth of hay placed over the drier at any one time, and any additional layers placed on top of hay which has been previously dried should be of less thickness as the total depth of hay is increased.

Heating tobacco barns with stokers, N. C. TETER and E. G. MOSS. (Coop. U. S. D. A.). (*North Carolina Sta. Bul.* 352 (1945), pp. 8, illus. 4).—A practical presentation of furnace and stoker installation, time clock control, and heat saving methods of construction for tobacco curing barns.

Performance of grain bin floors, E. R. GROSS. (U. S. D. A.). (*Agr. Engin.*, 26 (1945), No. 10, pp. 417-420, illus. 3).—Results of replicated tests made of 19 floor types installed in bins filled with wheat over a period of from 12 to 35 mo., totaling approximately 89 bin years, are given. In evaluating the results of the trials two determining factors were used: (1) The presence of spoiled grain on the floors, and (2) the moisture content of the grain in the 3-in. layer at the floor. Nine floor types proved effective in both of the factors, namely: (1) Steel on earth (floor-wall joint not calked); (2) steel on earth (floor-wall joint calked); (3) steel on gravel; (4) steel on joists (steel floor supported by 2- x 4-in. floor joists spaced 6 in. on centers set on concrete blocks allowing free circulation of air beneath); (5) concrete with aluminum-fibrl paper overlay; (6) concrete, roll-roofing overlay with laps cemented; (7) 1-in. matched flooring on joists; (8) 1-in. subfloor, building paper and 1-in.

finished floor on joists; and (9) roll roofing, laps cemented, placed on an earth fill. Six types failed due to either spoiled grain or excessive moisture or both, namely: (1) 4-in. reinforced concrete on earth, (2) concrete on 6-in. gravel fill, (3) concrete with 1-in. board overlay, (4) 4-in. concrete slab placed on a tile block platform with asphalt-saturated felt between the concrete and tile, (5) concrete with one coat of emulsified asphalt, and (6) concrete with two coats of emulsified asphalt. Four types were uncertain in that no spoilage occurred but moisture was excessive in at least one trial: (1) Steel on tile, (2) perforated steel on joists, (3) two-course concrete, and (4) concrete with aluminum-foil paper and board overlay.

Handling and storing soft corn on the farm, C. K. SHEDD. (Partly coop. Iowa Expt. Sta.). (*U. S. Dept. Agr., Farmers' Bul.* 1976 (1945), pp. 13+, illus. 6).—Practical methods are given to meet the problems, especially those of drying.

Sweetpotato storage houses, T. A. H. MILLER and J. W. SIMONS (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin.*, 1944, pp. 14+, illus. 4; rev. 1945, pp. 17, illus. 4).—The authors present practical requirements for sweetpotato storage houses and discuss insulation, heating equipment, and ventilator requirements. Detailed plans and bills of materials for both frame and masonry constructed storages having capacities of 500, 4,000, 8,000, and 20,000 bu., respectively, are given, together with suggested alteration to existing buildings for conversion into safe and desirable sweetpotato storage facilities.

A simple method of sealing gas- or vacuum-packed tins, W. A. BRYCE and H. TESSIER (*Canad. Jour. Res.*, 23 (1945), No. 5, Sect. F, pp. 304-305, illus. 3).—A method of soldering tins in a gaseous atmosphere or in a vacuum, utilizing a specially devised small coil of resistance wire as the heating element, is described.

A 3-zone farm refrigerator, F. D. YUNG (*Nebraska Sta. Agr. Engin. Prog. Rpt.* 11 (1945), pp. [5], illus. 3).—A descriptive account of a 74-cu. ft. experimental model with compartments for chilling, freezing, and frozen storage. Approximate materials cost exclusive of labor is given as \$715 and average operation cost at 250 kw.-hr. per month. This unit is still in the laboratory trial stage.

AGRICULTURAL ECONOMICS

Final report of the War Food Administrator, 1945, M. JONES (*U. S. Dept. Agr., War Food Admin. Rpt.*, 1945, pp. 39+).—The report covers the 2-yr. period ended June 30, 1945. It discusses the activities, problems, and results of the work of the Administration under the following headings: Food programs and problems in 1943 and 1944; support prices, July 1943-June 1945; farm production; the war-food distribution job; storage and transportation; and farm labor. The "tools" of food production are discussed in sections on farm machinery and equipment, chemicals and fertilizers, containers, food-processing equipment, surplus war property, and other food-program "tools."

Impact of the war on the financial structure of agriculture, A. S. TOSTLEBE, D. C. HORTON, R. J. BURROUGHS, H. C. LARSEN, L. A. JONES, and A. R. JOHNSON (*U. S. Dept. Agr., Misc. Pub.* 567 (1945), pp. 199+, illus. 35).—This report was issued in processed form in 1944 (*E. S. R.*, 92, p. 570). Miscellaneous Publication 558 (*E. S. R.*, 93, p. 211) is a brief printed summary.

The annual report of the Farm Security Administration, 1943-44 (*U. S. Dept. Agr., Farm Security Admin. Rpt.*, 1944, pp. 14+).—This report discusses adjustments in current operations and progress made in 1943-44 in the fields of rural rehabilitation, farm ownership, water programs, group services, cooperatives, health services, assistance to war veterans, sale of resettlement farms, and flood and wind-storm loans.

1943-44 summary of outstanding Federal and State legislation affecting rural land use, R. McQUOWN (*U. S. Dept. Agr., Bur. Agr. Econ., L. E. Bul. 70 (1945), pp. 160+*, illus. 1).—Brief digests are included of the more important laws enacted regarding agricultural adjustment, agricultural labor, credit and insurance, forestry, marketing, public lands, rural electrification, water use and control, conservation, cooperatives, governmental cooperation, government structure and administration, grazing, land tenure, public finance, rural facilities, services to agriculture, taxation, and zoning and planning; and miscellaneous subjects.

Farming in California for the newcomer, A. SCHULTIS. (Coop. U. S. D. A.). (*California Sta., 1945, rev., pp. 26, illus. 2*).—The climate, soils, irrigation, and agricultural regions of the State are described. Types of farms and size of farm business are discussed and suggestions and information given as to entering California agriculture and selecting, buying, financing, etc. a farm.

Facts for prospective farmers and ranchers in South Dakota, C. R. HOGLUND (*South Dakota Sta. Cir. 59 (1945), pp. 16, illus. 2*).—Topics discussed are farming as a business, desired qualifications of a farmer, farming opportunities in the State, typical farm and ranch organizations, desirable size, choosing and financing the farm or ranch, buying or renting, capital required to start farming, and factors contributing to success. A map shows the types of farming and ranching in the State by areas.

Foreign Agriculture [September 1945] (*U. S. Dept. Agr., Foreign Agr., 9 (1945), No. 9, pp. 129-144, illus. 4*).—An article on Agriculture in Japan: Prewar, by W. I. Ladejinsky (pp. 130-142), describes the topography, climate, and soils, and discusses the farm population, land utilization, land tenure, farming practices, agricultural production, and the economic position of the farmer. An article on Turkey's Agricultural Land Law (pp. 142-143) includes brief statements as to the objectives of the legislation known as the Law Providing Land for Farmers, approved by the Grand National Assembly on June 11, 1945, and describes briefly the position of agriculture, the lands for distribution, persons to receive lands, financial terms, and the effects of the law.

Usual dates of planting and harvesting commercial truck crops for fresh market, by seasonal groups and States, C. O. PARKER and R. ROYSTON (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, pp. 65+*, illus. 3).—Tables for different crops show by States the planting and harvesting periods (average 1934-43); acreage, yield, and production; and the principal areas of production.

Analysis of 7,851 fatal farm-work accidents in the United States, 1940-43, J. D. RUSH (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, pp. 9+*, illus. 2).—Basic data relating to the accidents were obtained by the Vital Statistics Division of the Bureau of the Census from the Public Health departments of the various States. Analyses are made of the frequency rate of fatalities; the two principal causes of fatal accidents; and the distribution by States, sex, age groups, seasons of the year, etc.

The frequency rate for the United States was 6.7 killed per 100,000 farm people. Use of machinery accounted for 47 percent and handling livestock for 20 percent of the fatal accidents. The greatest number of fatal accidents occurred in the 60-69 age group.

Arizona farm labor situation (Arizona Sta. Rpt. 1944, pp. 19-20).—The estimate of year-round men required in 1944 was 6,400 as compared with 7,600 for 1943. Changes in crop acreages and especially changed methods of using labor in certain operations resulted in smaller year-round labor requirements. For example, it became quite the common practice to employ but one man to take care of a head of irrigation water, his duties continuing through the round of 24 hr., where formerly two men were employed. Seasonal laborers ranged in numbers from 9,000 in March to 30,000 in December 1944. These figures are lower than corresponding estimates

for 1943. Nearly all those required during 8 mo. of the year are resident in Arizona, but the 4 mo. from September through December drain all available supplies within the State and call for help from outside. Year-round and seasonal laborers totaled something like 18,000 on April 1, 1944. Several hundred Mexican nationals filled in some of the shortage.

Mechanization of the cotton harvest, F. J. WELCH and D. G. MILEY (*Mississippi Sta. Bul. 420 (1945), pp. 24, illus. 10*).—The inefficiencies in cotton production and the need of reduced production costs are discussed. Using data for 2,229 bales of cotton picked in the Delta area with 12 picker-type mechanical pickers in 1944, analysis is made of the cost per bale, effect on grade and quality, and the amount of cotton left in the field with mechanical pickers, as compared with hand picking.

In the Delta area, 65 percent of the total labor for cotton is required for harvesting. The machines picked an average of 4.3 bales per 10-hr. day. The machine-picked cotton averaged 1.4 grades lower than the hand-picked cotton on the same plantations. Preliminary tests showed machine-picked cotton to have slightly superior spinning quality. The percentage of cotton left in the field was 9 percent with the mechanical pickers as compared with 2 percent with hand picking. The costs per bale were for hand picking, cost of picking, \$37.76; and for machine picking, cost of picking, \$7 38, loss in grade, \$18.40, and loss of cotton (left in the field), \$7.62, making a total cost of \$33.40.

Marketing and manufacturing margins for textiles, L. D. HOWELL (*U. S. Dept. Agr., Tech. Bul. 891 (1945), pp. 148+, illus. 12*).—This bulletin deals with the break-down of the farm-retail price spreads for textile products into their component charges and costs, and with the possibilities of reducing these charges and costs. Detailed data are presented to show the margins or costs for the various groups of services rendered and the items of costs included. The data for cotton and wool begin with farm prices and those for rayon and silk with prices to manufacturers. The marketing channels and division of the consumer's dollar for cotton and cotton products and wool and wool products are discussed. The several sections analyze and discuss the marketing margins for cotton and wool; cotton, wool, rayon and silk, and knit-goods manufacturers; dyers and finishers; apparel and household-goods manufacturers; and wholesalers' and retailers' margins, usually in subsections on charges or costs, items included in margins, means of reducing costs, and importance of reduction. A bibliography is included.

"Results show that the margins or costs of making the various conversions and for rendering the various services incident to taking the raw fibers from farms and delivering the finished products in the form of apparel and household goods to consumers were so great that in 1939 returns to growers for farm production of the fibers averaged only about 8 ct. for cotton and about 11 ct. for wool of the consumer's dollar paid for the finished goods. The proportions of the consumer's dollar paid for the finished goods that goes to farmers for the production of the raw fibers used usually vary directly with changes in farm prices of the fibers. Margins for merchandising the raw fibers, including ginning and baling for cotton but not including scouring for wool, averaged, in 1939, about 3 ct. of the dollar paid by the consumer for the finished goods. The proportions of the consumer's dollar accounted for by the combined margins for spinning yarn, weaving cloth, and dyeing and finishing the cloth, amounted to about 19 percent for cotton and 13 percent for wool; those for manufacturing apparel and household goods, about 30 percent for cotton and 35 percent for wool; and those for wholesaling and retailing, about 41 percent for cotton and about 38 percent for wool." The groupings of the cost items indicated that salaries and wages accounted for about 50 percent of the farm-to-retail price spreads for textiles, advertising about 4 percent, and

the combined profits of all agencies, except farmers, amounted to about 9 percent of the retail price of the finished goods. It is pointed out in the discussion of means for reducing margins or costs of specific items, functions, or agencies, that by increasing the volume of cotton ginned per unit of equipment, by using better equipment more efficiently, and by other economies, the net costs of ginning and baling in many instances might be reduced 25 percent or more, and that margins for retail goods might be reduced as much as 10 percent in many instances by the use of self-service or simplified service arrangements operated under favorable conditions. The distribution of the consumer's dollar indicated that: "A reduction of 10 percent in retail margins in 1939, for example, would have amounted to about as much as total margins for merchandising the raw fibers, including margins for ginning and baling cotton, and to more than 15 times as much as a reduction of 25 percent in margins for ginning and baling cotton."

Tobacco auction markets in Kentucky, C. M. CLARK and H. B. PRICE (*Kentucky Sta. Bul.* 474 (1945), pp. 15, illus. 6).—The development and advantages of, the decline in number, the shifts in location, the changes in size of tobacco markets, and some of the factors associated with market adjustments are discussed.

Cooperative possibilities in freezing fruits and vegetables, A. L. GESSNER (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt.* 84 (1945), pp. 60+, illus. 28).—The growth and outlook for the frozen fruit and vegetable industry and the operation of a few efficient cooperatives are described. The initial requirements for processing frozen fruits and vegetables, and the product—its preparation, packing, storage, transportation, distribution, etc.—are discussed. Information is included as to plant facilities and equipment, conversion of dehydration facilities for use in freezing, methods of freezing, and refrigeration systems.

Cold storage locker plants in Ohio, R. W. SHERMAN (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul.* 188 (1945), pp. 24+, illus. 1).—A brief preliminary report on the locker facilities, patron use of locker service, and future prospects for locker plants in the State, as shown by information obtained from 144 locker plants and 1,385 patrons of 51 plants.

Livestock, meats, and wool market statistics and related data, 1944 (*U. S. Dept. Agr., Prod. and Market. Admin.*, 1945, CS-14, pp. 77+).—A continuation of the series (E. S. R., 92, p. 133).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Japanese farm holdings on the Pacific coast, A. POLI (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1944, pp. 25+, illus. 5).—This is a succinct presentation of the history of the Japanese on the Pacific coast, the Japanese in agriculture as regards farm acquisition, the alien land laws, and farm tenure, the disposition of Japanese farming interests during and after evacuation, and the probable postwar farm holdings.

Selecting Arizona settlers, E. D. TETREAU (*Arizona Sta. Bul.* 196 (1945), pp. 28+, illus. 4).—The author states the criteria and methods used by public and private agencies in selecting settlers for reclaimed lands, with particular reference to returned war veterans and others desiring to farm in Arizona.

The Massachusetts hill towns in wartime, E. J. NIEDERFRANK (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1945, pp. 26, illus. 1).—This is a study of how five hill towns in Hampshire County have participated in war-related programs and what other effects the war has had upon them.

A variety of war programs have come to hill town people, including air raid protection, aircraft observation, first aid and home nursing instruction, Red Cross sewing, blood donation, salvage collection, and postwar planning. They were brought to communities by several nonlocal agencies in more or less uncoordinated fashion and

not always with regard to local conditions or organizations. The Grange, Legion, women's groups, and other local organizations have had attendances reduced 25 to 30 percent, have had fewer regular meetings, and have altered activities and programs to meet wartime conditions, but no organization has ceased to function on account of the war. The churches have been the least affected. It has been more difficult to find local leaders for activities because of losses of population and travel restrictions and because people were more busy. On the whole, the surface effects of the war on the hill towns have been slight, and local life appears about as usual. Apparently these towns will have 12 to 15 percent less population in the future than before the war unless tendencies are offset by a slight back-to-the-land movement and by making their economic and social life more attractive to young people.

FOODS—HUMAN NUTRITION

The importance of commercial processing for the protein value of food products.—I. Soybean, coconut, and sunflower seed, H. H. MITCHELL, T. S. HAMILTON, J. R. BEADLES, and F. SIMPSON. (Univ. Ill.). (*Jour. Nutr.*, 29 (1945), No. 1, pp. 13-25).—The nitrogen balance method, using growing rats, was employed to determine the digestibility and biological value of the proteins ($N \times 6.25$). A comparison of raw, partially exploded (45 seconds' steam plus 165 pounds' pressure), and exploded (60 seconds' steam plus 185 pounds' pressure) soya flour showed no appreciable differences in the gross chemical composition, while the true digestibilities and biological values were 84.8 and 59.4 for the raw flour, 95.6 and 75.2 for the partially exploded flour, and 93.4 and 71.2 for the exploded soya flour. Studies on specially processed coconut meal and sunflower seed meal (defatted by a solvent extraction method employing low temperatures not in excess of 75° C.) gave digestibility and biological values of 86.1 and 70.7 for coconut meal protein and 94.3 and 64.5 for sunflower seed meal protein. The "net" protein content (based upon the total protein content in relation to the digestibility and biological value of the protein) was for sunflower seed meal 33.7 percent, partially exploded soya flour 30.2, fully exploded soya flour 27.8, raw soya flour 21.4, and coconut meal 12.6 percent. The authors point out that drastic heat treatment usually exerts a destructive effect upon heat labile nutrients, including protein, and that milder processing on extracting oils from nonleguminous oil-bearing seeds can yield a highly nutritious product.

Sulfur dioxide vs. blanching as an agency for inactivating peroxidase and catalase for dehydration and freezing, H. D. BROWN, R. M. SHORT, and E. K. ALBAN. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 44 (1944), pp. 193-195).—The effectiveness of steam blanching for retention of quality and vitamin content in frozen or dehydrated vegetables was compared with that of SO_2 treatment carried out by immersing the vegetable tissue in SO_2 solutions (0.1-2.0 percent SO_2 by weight) under partial vacuum. The results of 1 year's trials are summarized as follows: "SO₂ treatments on carrots, potatoes, collards, and spinach did not give as satisfactory a dehydrated product as those steam blanched. Collards and spinach, however, did retain more vitamin C under SO_2 treatment than with steam blanch. Pimiento peppers showed a favorable response to SO_2 treatment over steam blanch. More vitamin C was retained and the dehydrated product seems worth while, especially as a seasoning agent when powdered. Apples and peaches respond to SO_2 treatment rather favorably, and the frozen and dehydrated fruits make a very palatable product."

Making grape juice in the home, C. S. PEDERSON (*New York State Sta. Cir.* 166, rev. (1944), pp. 7, illus. 6).—In this revision of an earlier edition (E. S. R., 76, p. 5), instructions are given for pressing out the juice (preferably hot pressing of washed, stemmed grapes heated to 140°-145° F.) by a simple hand press of

nutcracker type for small-scale operations, or by a home-made hydraulic-type press for bushel lots. Instructions are also given for bottling, capping, and pasteurizing the juice.

Diet formulary (*Washington: Navy Dept., Bur. Med. and Surg., 1945, pp. 102+*)—This formulary, the collation of which is credited to G. F. Schmitt, presents in brief, concise, and usable form a general discussion of the caloric requirement and the method for estimating it for different individuals under different conditions of activity. Basic tables and information presented include standard height-weight tables; a food nomogram for estimating required calories; the National Research Council recommended daily allowances of specific nutrients; a classification of fruits and vegetables according to carbohydrate content; a classification of foods as best, good, or fair sources of vitamin A, thiamine, riboflavin, niacin, pantothenic acid, ascorbic acid, vitamin D, and vitamin K; a classification as good sources of common minerals; simple rules for preserving vitamin content in the preparation of foods; a table of carbohydrate, protein, and fat in 100-gm. portions (defined in terms of household measurements); a table of dietary equivalents to facilitate dietary substitutions; and minimal daily dietary allowances of food from basic food groups. Qualitative general diets for normal conditions and qualitative special diets for gastrointestinal diseases, cardiovascular renal disease, diabetes, allergy, and for reducing and other miscellaneous conditions are outlined, and extended in some cases with a few type quantitative diets.

The intermediary metabolism of fatty acids, W. C. STADIE (*Physiol. Rev.*, 25 (1945), No. 3, pp. 395-441)—This review is concerned with current views on intermediary metabolism of the fatty acids, i. e., the chemical reactions involved in the complete or partial oxidation of the fatty acids in mammalian organs. Controversial aspects are discussed and the evidence evaluated. Questions of digestion, absorption, transport, and storage of fats are not considered; nor are other special topics, such as metabolism of branched fatty acids, the use of deuterium in the study of fat metabolism, hormonal regulation of fat metabolism, lipotropism, and lipocaic. Recent reviews covering these special phases are cited. The bibliography includes 193 references.

Inadequacy of lactose and beta-lactose as dietary carbohydrates for the rat, B. H. ERSHOFF and H. J. DEUEL, JR. (*Jour. Nutr.*, 28 (1944), No. 4, pp. 225-234).—Male and female rats of the Long-Evans (L. E.) and University of Southern California (U. S. C.) strains (the latter a modified Wistar strain) were placed at weaning on purified rations containing lactose, beta-lactose, glucose, galactose, sucrose, or cornstarch as the sole source of carbohydrate. The authors observed that beta-lactose in particular in the (L. E.) strain produced a syndrome consisting of severe diarrhea, edema, various degrees of alopecia, and finally death. Length of survival averaged 4.9 days. Milder symptoms occurred in the (L. E.) strain with lactose, and survival time averaged 11.5 days. Under similar conditions the (U. S. C.) strain showed a survival time of 22 and 26 days on the beta-lactose and lactose rations, respectively. Attempts to modify the beta-lactose syndrome in the (L. E.) rats by substituting butterfat, oleomargarine, or lard for the corn oil in the diet were all unsuccessful. When the beta-lactose diet was not fed until the forty-ninth day of life, the survival time of the (L. E.) rats was increased to 14 days. A relationship was also observed between the severity of the syndrome and the previous maternal diet. The possible reasons for the pathological conditions obtained with beta-lactose or lactose as the sole source of carbohydrate in the diet are discussed in detail.

Effect of acid beverages containing fluorides upon the teeth of rats and puppies, J. S. RESTARSKI, R. A. GORTNER, JR., and C. M. McCAY (*Jour. Amer. Dent. Assoc.*, 32 (1945), No. 11, pp. 668-675, illus. 4).—In the experiments described, rats and puppies were allowed to drink a common "cola" beverage for 5 days or

more. The beverage, purchased at a dispensing machine, was found to contain 10 percent sucrose and 0.055 percent H_3PO_4 and to have a pH of 2.6. Upon sacrifice of the rats, the teeth in the dissected jaws were examined and found to show severe destruction of the enamel on the molars. With prepared solutions of the same sucrose and H_3PO_4 concentrations and the same pH as the commercial product, similar results were observed. Preliminary observations on six puppies showed that consumption of acid drinks also produced gross and microscopic changes in their deciduous teeth. Fluorine, as sodium fluoride, included in the acid beverage at levels of 1, 6, and 20 p. p. m., decreased but did not completely prevent the destruction of the enamel in the majority of the rats tested. Within the limits tested, no apparent differences were observed in the protective action of the different levels of fluorine. Comparison of the effects produced by the sucrose-acid drink and by a solution of similar sweetness and pH containing 357 mg. saccharin and 0.55 gm. H_3PO_4 per liter, indicated that the sucrose aggravated the effect of the acid. When the saccharin-acid solution was brought to the same viscosity as the sucrose-acid solution by the addition of a physiologically inert cellulose derivative, it still affected the rat molars much less than the sucrose-phosphoric acid solution, thus suggesting that viscosity was not an important factor in the action of the latter.

The effect of succinylsulfathiazole and phthalylsulfathiazole on the bacterial flora of rat feces, A. K. MILLER (*Jour. Nutr.*, 29 (1945), No. 2, pp. 143-154).—"When a highly purified diet containing 0.5 percent to 2 percent succinylsulfathiazole or phthalylsulfathiazole was fed to rats over a long period of time there developed signs of nutritional deficiency which were corrected by the feeding of biotin and folic acid. The feeding of such sulfonamides also caused a decrease in the coliform count of the rat feces, but caused no significant change in the number of 'total aerobes,' 'total anaerobes,' or anaerobic spores in the feces. Lower levels of biotin, folic acid, and pantothenic acid were excreted in the feces of rats fed diets containing the drugs than were excreted by rats fed the same diet without the drug. Neither a sulfonamide-resistant nor a sulfonamide-sensitive strain of *Escherichia coli* synthesized as much folic acid when grown in the presence of sulfonamides as was synthesized during growth in a medium not containing the drug."

[Studies on vitamins in foods] (*Idaho Sta. Bul.* 264 (1945), pp. 25, 26).—Analyses of rose hips, gathered in September and October from wild roses in Idaho, showed them to contain from 900 to 1,400 mg. of ascorbic acid per 100 gm. Purées made from the rose hips were found to be high in ascorbic acid, but rose hips preserved by dehydration in a home-type dehydrator lost practically all of their ascorbic acid. Freshly picked rose hips packed immediately in mason jars and held in cold storage retained their ascorbic acid for many months.

Frying, poaching, boiling, and scrambling of eggs resulted in a loss of only about 8 percent of the riboflavin and about 15 percent of the thiamine originally present in the raw eggs.

Raw, dried Alaska field peas were found to contain approximately 8 µg. of thiamine, 30 µg. of niacin, and 2.3 µg. of riboflavin per gram. In the processes of soaking and cooking, there was about a 15-percent loss in thiamine and riboflavin and only a very slight loss of niacin.

The vitamin content of fifteen varieties of Arizona dates, M. C. SMITH and H. FARRANKOP (*Arizona Sta. Mimeog. Rpt.* 69 (1945), pp. 7+).—Dates of 15 varieties, chiefly of the semisoft type but including some of the soft type, were obtained from the station experimental farm at Yuma where they had been pollinated, processed, and packed for sale according to commercial procedure. The dates varied in size, averaging from 7 gm. per date for the small Khadrawy variety to 18 gm. per date for the large Laguna variety. The larger dates yielded 90-92

percent edible portion upon removal of the seed, the smaller dates 82–85 percent. The moisture content ranged from 18 percent in the semisoft Deglet Noor dates to 33 percent in the soft Sayer dates and averaged 24.5 percent for the 15 varieties. Vitamin determinations by methods noted showed carotene content to be low, ranging from 0.01 mg. per 100 gm. edible portion in Maktoom to 0.035 mg. in Amarillo dates and averaging 0.02 mg., or 40 International Units; total carotenoids were slightly higher, averaging 0.32 mg. per 100 gm. No measurable amount of ascorbic acid (total and reduced) was found in any variety. The thiamine content ranged from 0.08 mg. per 100 gm. edible portion in Gush dates to 0.15 in Maktoom dates and averaged 0.10 mg. in the 15 varieties. Riboflavin ranged from 0.07 mg. in Iteema to 0.12 mg. in Khadrawy dates and averaged 0.10 mg. per 100 gm. edible portion. It is pointed out that the amount of thiamine and riboflavin furnished by 100 gm. of date pulp from 9 average-size dates compared favorably with the amounts of these vitamins provided by 100-gm. servings of other fruits

In the carotene determinations by the method of Moore and Ely (E. S. R., 87, p. 763), magnesium carbonate as an adsorbent gave more complete adsorption than dicalcium phosphate, the former permitting 94 to 100 percent recovery in tests with pure β -carotene. In the thiamine and riboflavin determinations, following the basic procedure of Conner and Straub (E. S. R., 87, p. 10), extractions were made for 1 hr. at 70°–80° C. rather than at boiling temperature, since the latter yielded an extract which did not pass readily through the decalso used as an adsorbent. In order to eliminate material which slowed the passage of the extracts through the base exchange tubes, it was found necessary to use pectinol along with clarase in an overnight treatment.

The pro-vitamin A and vitamin C values of melons served to the Army and Navy training groups at the University of Arizona, M. C. SMITH, H. FARRANKOP, E. CALDWELL, and M. A. WOOD (*Arizona Sta. Mimeog. Rpt 67 (1944), pp. 11+*).—The different kinds of melons served at mess were purchased as available on the local market from June through September. Representative melons from the lots thus used were analyzed for ascorbic acid and carotene in the edible portions. The cantaloups (yellow-fleshed) contained 25–63 mg. ascorbic acid per 100 gm., with an average of 43 mg. for 141 samples, and 1.52–3.10 mg. carotene with an average of 2.22 mg. for 68 samples. Other larger, yellow-fleshed melons, such as the Persian and Japanese melons, gave values within the range of those obtained for the cantaloups; the 8 Persian melons tested averaged 35 mg. ascorbic acid and 3.10 mg. carotene per 100 gm. edible portion. Ascorbic acid in the 38 samples of honeydew melons (greenish-white flesh) ranged from 14 to 33 mg. and averaged 21 mg. per 100 gm. edible portion; carotene, however, was very low, averaging only 0.03 mg. per 100 gm. Casaba melons were still poorer sources of ascorbic acid than the honeydews, ranging from 9 to 21 mg. and averaging 13 mg. per 100 gm. edible portion in 37 samples; carotene content averaged only 0.03 mg. per 100 gm. The watermelons tested at different times averaged only 8 mg. ascorbic acid and 0.87 mg. carotene per 100 gm. edible portion (66 and 14 samples, respectively).

The variability observed in the ascorbic acid content of cantaloups was apparently associated with degree of ripeness and changes in storage. Thus, cantaloups of optimal ripeness tested early in the season averaged 47 mg. ascorbic acid per 100 gm. edible portion, whereas those which were edible but slightly underripe and too firm averaged 43 mg.; edible but slightly overripe cantaloups averaged 38 mg.; while those decidedly overripe and poor-tasting contained about 28 mg. ascorbic acid per 100 gm. Cantaloups held 1 and 2 weeks at 50° F. and 70 percent relative humidity lost, respectively, one-fifth and one-fourth of the ascorbic acid originally present; weight losses in these storage periods amounted to 8 and 11 percent, respectively, but most of this was due to moisture loss in the rind. Cantaloups

and watermelons cut for serving and held at room temperature for 2 to 4 hr., as in cafeteria service, lost none of their ascorbic acid. Some evidence was obtained to show that the softer inside portion of the cantaloup next to the seeds was somewhat higher in both ascorbic acid and carotene than the harder firmer portion next to the rind.

Estimates made by applying the vitamin values to the weights of portions served at mess showed that, on the average, cantaloups were an excellent source of both ascorbic acid and carotene; Japanese and Persian melons were very good sources; and watermelons, because of the large size of the serving portions, a fair source of both vitamins. Casaba and honeydew melons rated fair and good, respectively, as sources of ascorbic acid but furnished little or no carotene.

Some factors affecting the carotene, thiamin, and ascorbic acid content of carrots grown in Arizona (1942-43), M. C. SMITH, E. CALDWELL, and L. O. BURLINSON (*Arizona Sta. Mimeog. Rpt. 66 (1944), pp. 9+*).—Imperator and Red Cored Chantenay carrots planted at the Yuma Valley and Salt River Valley experimental farms in October, November, December, February, and March in 1942-43 were harvested from each planting at 30-day intervals beginning with a 60- or 90-day growing period, when the carrots had attained pencil size, and extending through a 240-day growing period. Ascorbic acid by the method of Morell (E. S. R., 87, p. 15), thiamine by the method of Conner and Straub (E. S. R., 87, p. 9), and carotene by the method of Moore and Ely (E. S. R., 87, p. 763) were determined in the carrots, shipped (with tops on and wrapped) and prepared for analysis within about 24 hr. after digging. In carotene content, there was no consistent superiority of one variety over the other, but with both varieties and in all plots carotene increased with the size of the carrots and hence with age, maturity, and length of growing period. The Yuma carrots of different sizes and stages of development and planted in different months ranged from 2 to 20 mg. (approximately 3,300 to 33,000 International Units) carotene per 100 gm fresh weight. "The influence of soil temperature upon the rate of growth and, therefore, the increase in carotene content is evident from the higher carotene content of carrots from the south row over those in the north row of the east-west beds. Also, carrots planted in October in the Salt River Valley at a higher elevation and, therefore, in a cooler climate with longer chilling periods grew and increased in carotene content more slowly than those planted at the same time in Yuma. Carrots planted in the spring months, February and March, not only grew more rapidly as expected, but the carrots of the same marketable size were appreciably higher in carotene content."

The analyses showed the carrots to be a poor source of thiamine since all the samples tested, regardless of variety, size, maturity, or length of growing period, contained only 0.04-0.07 mg. thiamine per 100 gm. fresh weight. The carrots were also relatively poor in ascorbic acid content; the highest amounts, 5-8 mg. per 100 gm., were found in the very young, pencil-size carrots while those of marketable size contained 3-6 mg. per 100 gm. No significant difference was observed in ascorbic acid in carrots planted in different months.

Tangerines—their pro-vitamin A value, M. C. SMITH, E. CALDWELL, and H. FARRANKOP (*Arizona Sta. Mimeog. Rpt. 70 (1945), pp. 5+*).—Algerian and Dancy tangerines, sampled two or three times from 14 tangerine trees in 3 sections of Arizona and picked from the north, south, east, and west sides of the trees, were analyzed to determine the carotene content of the segments and of the mechanically reamed, strained juice. Carotene was determined by the method of Moore and Ely (E. S. R., 87, p. 763), modified to permit drying of the extract by filtration through sodium sulfate before evaporation for volume reduction, and further modified by substituting magnesium oxide for dicalcium phosphate in the adsorption column.

The results of about 150 analyses of the edible segments of the Dancy and Algerian tangerines showed them to contain, respectively, an average of 0.295 and 0.12 mg. carotene per 100 gm.; the strained juices averaged 0.15 and 0.05 mg. per 100 gm. of juice. Individual tangerines of the Dancy and Algerian varieties averaged 54 and 59 gm. in weight; refuse amounted to 26 and 32 percent, respectively, when the fruits were prepared as segments, and 46 and 54 percent when prepared as strained juice. Single fruits of these two varieties when served as segments furnished, respectively, 200 and 80 International Units of carotene. When the tangerines were juiced and the juice strained, however, the amount of carotene yielded per fruit was only one-third of that yielded when prepared as segments.

Vitamin A in relation to aging and to length of life. H. C. SHERMAN, H. L. CAMPBELL, M. UDLJAK, and H. YARMOLINSKY (*Natl. Acad. Sci. Proc.*, 31 (1945), No. 4, pp. 107-109).—In this extension of a long-time investigation, the effects of increased intake of vitamin A in the postponement of senility and the extension of life span of rats are further recorded. Basal diet A (five-sixths ground whole wheat and one-sixth dried whole milk with table salt and distilled water), with a vitamin A value of approximately 3 International Units per gram, was compared with the same diet with A increased to 6 and 12 I. U. per gram. In groups averaging from 108 to 165 animals each at the 3 and 6 I. U. level and from 24 to 36 at the 12 I. U. level, the length of reproductive period of females was 265, 312, and 369 days, respectively; the length of life of females 724, 801, and 830 days; and the length of life of males 652, 685, and 723 days. The successive increases in A resulted in increases in the reproductive period and life span in all cases.

Enriched, Morris type, and whole wheat flour as sources of the B-complex vitamins. B. D. WESTERMAN and E. G. BAYFIELD. (Kans. Expt. Sta.). (*Jour. Nutr.*, 29 (1945), No. 1, pp. 27-33, illus. 3).—Young rats (weighing between 40 and 50 gm.) were fed a B-complex-free basal ration consisting of vitamin-free casein 20 percent, corn oil 12 percent, salt mixture 5 percent, cod-liver oil 3 percent, and cornstarch 60 percent. In the succeeding growth period the rats received the test flour at the 30, 40, or 50 percent level in place of an equivalent amount of cornstarch. Weight gains of the animals were recorded every 6 days. Two types of enriched flour were included, and samples of whole wheat and enriched flour were obtained from two different mills.

The results showed that whole wheat is a better source of B vitamins than either Morris type or "old" enriched flour (70 percent extraction enriched at "old" level) when fed at 30-percent and 50-percent levels in the diet, while only slightly superior to the "new" enriched flour (70 percent extract new level of enrichment) at the 30-percent level. Whole wheat and new enriched flour promoted the same amount of growth when fed at 40-percent level, while at the 50-percent level the new enriched flour was superior. The amount of riboflavin present seemed to be the important factor in these diets. The growth on the rats on all these experimental diets was considerably less than that obtained with the positive controls on a stock diet.

Effects on the albino mouse of feeding diets very deficient in each of several vitamin B factors. J. H. JONES, C. FOSTER, F. DORFMAN, G. L. HUNTER, M. E. QUINBY, and D. L. ALEXANDER (*Jour. Nutr.*, 29 (1945), No. 2, pp. 127-136, illus. 1).—"Using a diet in which the B factors were supplied as pure compounds, a deficiency of each of four of the factors (thiamine, riboflavin, pyridoxine, and pantothenic acid) in the albino mouse has been studied. When thiamine was omitted from the diet the animals lived from 19 to 31 days. They did not show symptoms characteristic of this deficiency as are seen in the rat. In less acute vitamin B₁ deficiency the classical polyneuritic symptoms have been observed in this laboratory. Mice on the riboflavin-deficient diet lived from 34 to 202 days. Many of them

developed characteristic dermatitis about the head and especially on the ears. In some cases nearly the entire ear sloughed off. No specific symptoms or lesions (other than poor growth and death) resulted from the omission of pyridoxine from the diet. The animals lived from 28 to 67 days. Nearly all of the mice on this diet excreted in the urine a characteristic brownish-yellow pigment. The first death on the diet lacking in pantothenic acid occurred on the sixty-seventh day, and there was a survival of 21 percent when the experiment was discontinued (205 days). A loss of hair was the most outstanding sign of deficiency in these animals. In addition, a number of the mice developed some of the following signs: A profound spasticity of the extremities, acute arching of the spine, awkward gait, dryness of the skin with scaly desquamation, and hyperemia and edema of the eyelids."

The nicotinic acid, pantothenic acid, choline, and biotin content of fresh, irradiated evaporated, and dry milk, A. Z. HODSON (*Jour. Nutr.*, 29 (1945), No. 2, pp. 137-142).—Assays were carried out by microbiological methods using *L. arabimosus* for nicotinic acid and pantothenic acid determinations and a mutant of *Neurospora crassa* for choline and biotin. Fresh milk samples came from Illinois, evaporated milk from plants in 20 States, and dry milk from Wisconsin, Michigan, and Utah. The processed samples were all analyzed within a few weeks after manufacture. Values, calculated on a fresh or reconstituted basis for fresh (I), irradiated evaporated (II), dry skim (III), and dry whole milk (IV), were: Nicotinic acid I = 0.74 to 1.14, II = 0.83 to 1.28, III = 0.72 to 1.18, IV = 0.79 to 0.91 mg. per liter; pantothenic acid I = 1.9 to 4.2, II = 2.4 to 4.1, III = 3.1 to 4.3, IV = 3.2 to 3.5 mg. per liter; choline I = 131 to 169, II = 90 to 208, III = 54 to 160, IV = 83 to 229 mg. per liter, and biotin I = 32 to 84, II = 29 to 56, III = 28 to 40, IV = 29 to 58 µg. per liter. The average nicotinic and pantothenic acid, choline, and biotin values for fresh milk were 0.91 mg., 3.1 mg., 149 mg., and 47.1 µg. per liter, respectively. In the processing of irradiated, evaporated, dry skim, and dry whole milk no loss of nicotinic acid or pantothenic acid was apparent. On 9 samples of dry skim milk tested, the average values for choline and biotin were 104 and 34, respectively, somewhat lower than the values for the other types of processed milks.

Niacin (nicotinic acid), an essential growth factor for rabbits fed a purified diet, J. G. WOOLEY and W. H. SEBRELL (*Jour. Nutr.*, 29 (1945), No. 3, pp. 191-199, illus. 5).—Rabbits were fed a purified diet supplemented at two levels with the essential vitamins so that niacin alone became the limiting factor. With niacin included at a level of 20 mg. per 100 gm. diet, weight gains were comparable to those of rabbits maintained on a stock diet. Experiments using litter mates showed that practically no weight gains and resulting death (7 out of 11) before the end of the 19-week test period resulted when niacin was eliminated from the diet. Further tests using paired feeding methods and tripling the total vitamin content of the diet gave similar results. Experiments in which animals on the niacin-deficient diet were changed to the same diet containing niacin showed marked reversal of the downward trend and rapid increase in weight. Supplements of niacin were then added to the basal diet in amounts equivalent to 0.05, 0.1, 0.2, 1.0, 2.5, 5.0, 7.5, and 10.0 mg. per kilogram of body weight daily. The average weight of the rabbits in each group increased with each added amount of niacin until the level of 10.0 mg. per kilogram daily was reached. The average weekly consumption of food also increased in relation to the amount of niacin in the diet until the 5.0 mg. per kilogram level was reached.

The effect of environmental temperature on thiamine requirement of the rat, O. L. KLINE, L. FRIEDMAN, and E. M. NELSON (*Jour. Nutr.*, 29 (1945), No. 1, pp. 35-42, illus. 1).—Contrary to the conclusion of Mills (E. S. R., 87, p. 602), the authors find, with both rat-growth and rat-curative assays, that an increase in

environmental temperature results in a decreased thiamine requirement. This decrease appeared to approximate the decrease in caloric requirements. Assays were carried out at 70°, 85°, and 90° F. with different levels of thiamine which were fed separately by stomach tube. The curative response to a 6γ dose of thiamine was significantly longer at 85° than at 78° (average 12.4 days v. 8.7 days). At 90° a 3γ dose provided even a somewhat better response than a 6γ dose at 78° (11.6 days v. 9.1 to 9.9 days), while a 3γ dose at 78° produced no cure in four animals and a short cure of 2 to 4 days in the others. Average daily weight gains of rats at 78° and 90° were compared in terms of daily food intake and vitamin supplement fed (2.5γ, 10γ, 100γ per day). At 90° with near optimum (10γ) or excess (100γ) thiamine levels, the weight gains were smaller than at 78°, but the total food intake was disproportionately smaller at 90°, so that the gain in body weight per gram of food intake was consistently higher at this higher temperature. When the thiamine level was suboptimal (2.5γ per day), food consumption remained lower at 90° than at 78°, but a greater gain in weight was noted (1.0 to 1.1 gm. v. 0.7 to 0.8 gm. per day). The authors emphasize the necessity of maintaining a uniform environmental temperature for precision in performing the rat-curative assay for thiamine.

Observations on riboflavin excretion by the adult male, D. R. HAGEDORN, E. D. KYHOS, O. A. GERMEK, and E. L. SEVRINGHAUS (*Jour. Nutr.*, 29 (1945), No. 3, pp. 179-189, illus. 1).—Continuing the experiments of Kyhos et al. (*E. S. R.*, 92, p. 746) observations extending over a period of 2 yr. were made to determine the basic level of riboflavin excretion, the effects of supplementation upon riboflavin excretion, and any correlation between clinical signs and variations in riboflavin intake and excretion. Urinary riboflavin was assayed by the microbiological method. A marked correlation was found between the urinary excretion of riboflavin and the intake of materials rich in riboflavin (milk, liver, peanuts, and vitamin preparations). In 25 men eating the regular prison diet (with the exception that 14 of them drank less than 3 cups of milk per week) riboflavin excretions of 0.05 to 0.2 mg. per 24-hr. specimen were found. In 27 other subjects, on the regular diet which included 9 to 10 cups of milk per week, excretion ranged from 0.2 to 0.47 mg. (average 0.3 mg.). Of 16 men excreting 0.5 to 2.4 mg. daily, 13 of them drank extra milk, ate peanuts, or took vitamin tablets. Upon physical examination no clinical signs specifically attributable to ariboflavinosis could be identified with any particular group. Riboflavin supplements were given to determine the effect on the excretion level in the urine and the percent retention by the subject. The data are tabulated to show that even in the group showing the lowest riboflavin intake only 55 to 66 percent of the supplements are retained. The authors concluded from these observations that the daily riboflavin intake on the ordinary prison diet was approximately 1.5 mg., but that in those subjects who habitually avoided milk the intake was about 0.5 mg. On this low level of riboflavin, maintained over a period of 2 yr., no cheilosis or other lesions formerly attributable to riboflavin deficiency were observable. The only evidence of deficiency was decreased excretion of test doses, i. e., tissue desaturation.

Effect of sunshine upon the ascorbic acid and riboflavin content of milk, A. D. HOLMES and C. P. JONES. (Mass. Expt. Sta.). (*Jour. Nutr.*, 29 (1945), No. 3, pp. 201-209, illus. 1).—Continuing the previous experiments of Holmes et al. (*E. S. R.*, 92, pp. 142-144), on factors influencing the ascorbic acid and the riboflavin content of milk, studies of the effect of measured amounts of sunlight were made. Pasteurized milk samples in ½-pt. flint glass bottles were exposed for two 30-min. or two 60-min. periods to direct sunlight, the intensity of which was measured continuously by a pyrliometer. Temperature changes during the exposure period (which ranged from 18° to 30° C.) were recorded, and the

temperature changes in the milk samples were noted at the beginning and end of each period.

The results indicated that practically all of the ascorbic acid (reduced form) originally present in the samples (13.6 to 16.8 mg. per liter) is destroyed or oxidized upon exposure to sunlight for even 30 min. Riboflavin destruction is less rapid, being only about 10 percent after 60 minutes' exposure on a rainy day, and showing a maximum of 85 percent destruction after two 60-min. exposures to bright sunlight. In general the destruction of the vitamins is proportional to the increase in intensity of sunlight and to time and temperature of exposure.

Effects of light intensity, day length, temperature, and other environmental factors on the ascorbic acid content of tomatoes. K. C. HAMNER, L. BERNSTEIN, and L. A. MAYNARD. (U. S. D. A.). (*Jour. Nutr.*, 29 (1945), No. 2, pp. 85-97).—Continuing the experiments begun by Hamner et al. (E. S. R., 88, p. 560) and Hamner and Maynard (E. S. R., 88, p. 544), studies were made on several varieties of tomatoes grown in 14 different States. Variations in ascorbic acid content were considerable, ranging from 14.4 to 30.6 in Marglobe, 8.4 to 19.7 in Rutgers, and 10.7 to 29.0 in Pritchard. Studies on the effect of different stages of ripeness and storage at different temperatures showed only small differences in ascorbic acid content whether the fruit was harvested immature green, pink, ripe, or over-ripe (range 14.0 to 16.6 mg. per 100 gm., Pritchard variety). Mature green fruit stored until ripe at 65°, 70°, 75°, 80° and 90° F. gave values essentially the same when ripening occurred during the first week of storage (14.5, 14.4, 17.3, 14.0, and 14.0, respectively). Progressively lower values were found during the second and third weeks if ripening were delayed, values for the latter being 8.5, 8.2, 7.6, and 7.1 for temperatures of 65° to 80°. The ascorbic acid contents of the Stokesdale, Rutgers, or New York State varieties were generally unaffected by fertilizer treatment. Only with a high nitrogen fertilizer were lower values noted. The authors attribute the effect to the increase in foliage (shade) produced. Culture studies carried out on the Bonny Best strain (with temperature the only variable) at 78° and 63° gave consistently higher values, 18.5 v. 15.6, for the higher temperature. Further experiments (at 73°) were made, in which the plants were exposed to the illumination of "white" or "daylight" lamps for 8 or 16 hr., or grown in the greenhouse, showed ascorbic acid values of 16.7, 19.5, and 22.0, respectively. The final experiment comparing the ascorbic acid content of similar plants grown in sunshine and shade showed the greatest difference—25.8 v. 15.5. Duplicate experiments in which light conditions were reversed at the time of the first blossom or up to the time the first fruits were "mature green" showed a parallel reversal of ascorbic acid content. The authors infer from their results that the light intensity to which plants have been exposed just prior to harvest may be the dominant factor in determining the ascorbic acid content of the fruit.

Effects of variations in dietary vitamin C on the physical well being of manual workers. R. E. JOHNSON, R. C. DARLING, F. SARGENT, P. ROBINSON, M. BARTLETT, and A. KIBLER (*Jour. Nutr.*, 29 (1945), No. 3, pp. 155-165).—Studies were carried out on 24 normal adult males engaged in a variety of jobs which provided moderate physical exercise and required daily caloric expenditures estimated to be between 2,400 and 5,000 calories. One group (I) was maintained for 8 weeks on a diet devoid of vitamin C but adequate in other respects. The other groups consisted of normal controls (II), normal controls supplemented with 75 mg. ascorbic acid daily (III), and a "deficient diet" group supplemented with 75 mg. ascorbic acid daily (IV). Following this test period a final 2-week period was added, in which the groups (I) and (IV) were subdivided into two groups each, group (IA) and (IVA) receiving a normal diet, while (IB) and (IVB) received the normal diet supplemented with 300 mg. ascorbic acid. Tests of physical efficiency and various clinical and laboratory observations were made.

The results showed no significant changes in physical efficiency; in contrast, marked chemical changes occurred on the deficient diet. The serum ascorbic acid levels dropped to zero, and a marked decrease in the urinary output of ascorbic acid occurred during the 8-week period. In one case only did even minimal changes in the gums take place. During the 2-week "recovery" period all serum and urinary levels returned to normal or above—with above normal levels in both serum and urine—when 300 mg. were fed daily. The authors concluded from these observations that on a normal caloric intake and a diet adequate in all but ascorbic acid, no detectable deterioration in physical vigor nor visible inefficiency was apparent during an 8-week test period. Doses of 75 mg. ascorbic acid daily appeared adequate to maintain or even increase the body stores of the vitamin. The practical implications, for emergency feeding, were that vitamin C was somewhat less critical than certain other factors.

Vitamin C nutrition under camp conditions, D. F. MILAM and I. H. MANNING, JR. (*N. C. Med. Jour.*, 5 (1944), No. 2, pp. 41-43).—Ninety percent of 192 youths tested showed blood plasma ascorbic acid levels below 0.6 mg. per 100 cc. at the beginning of the experiment. After 6 weeks, in which they selected their food from a nutritionally adequate diet, 66 percent still showed low plasma values. Ten subjects were then fed 100 mg. ascorbic acid daily over a 6 weeks' period, in addition to their normal diet, to check whether inadequate choice was responsible for the low plasma findings. Twelve other subjects took a single 1-gm dose of ascorbic acid. Blood plasma levels were determined 2, 4, and 6 hr. after ingestion, and 24 hr. urinary excretion tests for ascorbic acid were made. Results showed: (1) With a daily supplement of 100 mg., in most instances 3 weeks were required to raise the plasma level to 0.6 mg. per 100 cc. in individuals with initial levels of 0.3 mg. or less, and (2) the plasma level of ascorbic acid furnishes a fairly reliable index to the degree of desaturation as indicated by urinary output following a 1-gm. dose of ascorbic acid.

Rôle of fat in incisor depigmentation of vitamin E-deficient rats, H. GRANADOS and H. DAM (*Science*, 101 (1945), No. 2619, pp. 250-251, illus. 1).—Five groups of rats, comprising six newly weaned animals, were reared for 80 days on the following diets: (1) Vitamin E deficient, fat free; (2) vitamin E containing, fat free; (3) vitamin E deficient, high fat (20 percent cod-liver oil); (4) vitamin E containing, high fat; and (5) normal controls (dog chow). Animals in groups (1), (2), and (4) developed incisor pigment essentially in the same way as group (5). In group (3) pigmentation occurred as in the other groups until about the twentieth day, when an abrupt disappearance of pigment was observed at the gingival margin. Thereafter, pigmented enamel progressively replaced pigmented enamel as the teeth erupted. All animals in group (3) had bluish white incisor teeth after 45 days. "These results indicate that depigmentation of incisors in vitamin E-deficient rats requires the presence of fat, presumably unsaturated fatty acids, in the diet, a finding which suggests that the phenomenon is related to some abnormal deposition or reaction of fat in the ameloblasts."

TEXTILES AND CLOTHING

Knitwear make-overs, C. L. SCOTT and A. HAGOOD (*U. S. Dept. Agr., Misc. Pub.* 575 (1945), pp. 16, about 30 illus).—This well illustrated publication offers practical suggestions for making over knitwear garments. Directions for mending, cutting, and seaming the knit materials are supplemented with working diagrams.

REPORTS AND PROCEEDINGS

Fifty-fifth Annual Report [of the Arizona Station] for the year ending June 30, 1944, P. S. BURGESS and R. S. HAWKINS. (Partly coop. U. S. D. A.). (*Arizona Sta. Rpt. 1944, pp. 100+*, *illus. 14*).—In addition to a climatological summary and material noted elsewhere in this issue, reports of progress are made on the year's results in agricultural chemistry and soils, including studies on soil reaction, water penetration, organic matter decomposition, acidulated fertilizers, boron toxicity, rubber content of native desert plants, and analyses of the feeding value of desert and range plants, baled alfalfa hay, and miscellaneous feeds; agricultural economics and sociology, including studies of cost of production of upland cotton and milk; agricultural engineering, including the preservative treatment of tamarisk fence posts and the planting of tamarisk trees for sawlogs; agronomy, including cotton studies as to irrigation, varieties and strains, and defoliation, variety tests of oats and sorghums, culture of guar and other green manure crops, and soil puddling; animal husbandry, including cattle fattening on wheat v. barley, steam rolling v. grinding barley and wheat, feeding "cutback" and light-weight steers, and progeny testing of Hereford sires; animal pathology, including studies of infectious keratitis, control of warbles in cattle with rotenone, and analyses of *Amaranthus palmeri* (a cause of poisoning in cattle); botany and range ecology, including studies of burweed control, climatic and grazing influences on desert grassland range, range forage utilization by jack rabbits, and the economic value of jojoba (*Simmondsia chinensis*); dairy husbandry, including the effect of cottonseed on milk, permanent pasture studies, and the Babcock v. the Mojonnier test for fat in homogenized milk; entomology and economic zoology, including studies of cottontail rabbits, the brown dog tick, the tomato russet mite, the squash borer and capsid, the orange dog (*Papilio cresphontes*), and the western leaf-footed plant bug (*Leptoglossus zonatus*); horticulture, including studies of the premature seeding of lettuce, breeding of cantaloups, lettuce, and onions, vegetable seed production, ascorbic acid production in Arizona vegetables, a new lettuce-planting sled, citrus investigations (N for grapefruit and orange and cover crop removal), and pecan varieties; human nutrition, including the vitamin content of milk, butter, carrots, oranges, melons, commercially canned fruit and vegetable juices, and home-dehydrated and institutionally cooked vegetables; plant breeding, including work with cotton, wheat, and alfalfa; plant pathology, including studies of southern sclerotial root rot and wilt of cotton, phymatotrichum root rot, diseases of guayule and guar, penicillin and crown gall, necrosis of giant cactus, dry rot of citrus, and diseases new to the State; and poultry husbandry, including breeding for egg production and feeding rations.

Wartime agricultural research: Fifty-second Annual Report of the Idaho Agricultural Experiment Station for the year ending June 30, 1945, C. W. HUNGERFORD ET AL. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul. 264 (1945), pp. 51, illus. 2*).—In addition to articles abstracted elsewhere in this issue in horticulture and foods, brief progress reports are given on beef cattle, sheep, swine, and animal diseases, including phosphorus supplements for steers and ewes, cull peas for hogs, feeding and breeding work with Poland China hogs, low incidence of bovine mastitis, and swine brucellosis vaccination; dairy production and manufacturing, including the influence of breed, feed, and processing on the riboflavin content of milk, influence of ripening temperatures and curd washing on Cheddar cheese, and a method of dehydrating cheese; poultry, including influence of quality of protein on egg production, variation of efficiency of proteins in chick rations, and conditions favoring low mortality; field crops and soils, including bindweed reinfestation, new varieties of sorgo and barley, and lime content of irrigated soils; fruits and vegetable crops, including variety tests with grapes; agricultural engineering, in-

cluding studies of labor-saving equipment, farm freezers, sugarbeet harvesters, distribution of irrigation water, rural electrification, and potato harvesters; bacteriology, including factors affecting the growth of alfalfa, and soil improvement by organic residues and pure cultures of soil bacteria; agricultural chemistry, including the vitamin A and carotene content of Idaho butter, destruction of riboflavin in milk, ripening of Cheddar cheese, and crop improvement by use of phosphate fertilizer; farm economics, including studies of hog production in the Palouse wheat-pea area, price trends, decrease of rural mortgages and interest rates, and relation of public services to land values; plant diseases, including studies of bean resistance, bacterial ring rot of potatoes, blossom-end rot and curly top of tomatoes, bacterial blight of carrots, and the overwintering of aster yellows on weeds; insects, including studies of flea beetles on potatoes, pea weevils, and onion thrips; human nutrition, including studies of the dietary value of peas and beans, and the ascorbic acid value of Idaho potatoes and its content in the university dining hall meals; and at the substations, including comparisons of phosphorus supplements for fattening steers, bonemeal for ewes, finishing beef calves, value of dehydrated beet tops and beet pulp for fattening steers and lambs, alfalfa variety tests, fertilizer for potatoes and mountain brome grass, grain rations for ewes, pasture needs for lambs, breeding of oats and barley, grass species for forage production on abandoned dry lands, bentonite as a water-proofing agent for potato cellars, use of ammonium sulfate in Canada thistle control and as a wheat and grass fertilizer, value of cultivation in grass seed production, and methods and implements for stubble-mulch farming.

Agricultural research in New Hampshire: Annual report of the director of the Agricultural Experiment Station for the year ending June 30, 1944, M. G. EASTMAN ET AL. (*New Hampshire Sta. Bul.* 354 (1944), pp. 68).—Brief summaries are given of the work in progress or completed in agricultural economics, including studies of milk marketing methods, feed and egg transportation, fertilizer purchases, and supply-price relationships for potatoes; agricultural engineering, including studies of potato storages and buck-rake construction; dairying, including studies of chore efficiency, dry rations for dairy calves and heifers, improving the solids-not-fat content of milk by selective breeding, and control of bovine mastitis; field crops, including studies of rotations with potatoes and sweet corn, cultural and fertilizer tests with potatoes, providing roughages by pastures, potash levels and persistence of clover in hay stands, and variety tests of oats, corn, and alfalfa; forestry, including the propagation of sugar maples; fruit production, including the effect of fertilizers on leaf scorch, measurement of winter injury, fertilizer tests with blueberries, variety tests of apples, grapes, and plums, and breeding work with strawberries, *Rubus* spp., blueberries, peaches, almonds, apples, and pears; insect control, including tests of DDT, tenacity agents, and various aerosols; ornamentals, including the growth of *Gerbera* in the greenhouse, carnation varieties, cultural tests with snapdragons, breeding work with chrysanthemums, carnations, *Saintpaulia*, *Kalanchoe*, begonia, and lily-of-the-valley; pastures, including management studies and species, improvement of clovers and timothy, and eradication of the common buttercup; plant pathology, including studies of tomato diseases, apple scab, and bacterial ring rot of potatoes; poultry, including studies of protein requirements at various stages of development, cause and prevention of gizzard lesions, pullorum investigations, anthelmintics, and contagious indigestion (blue comb); soils, including erosion control on potato farms, and influence of soil texture, moisture, and aeration on plant growth; vegetable production, including studies of the storage of squash, variety tests of vegetables, breeding of melons, peppers, peas, lima beans, and tomatoes, and treatment of seeds with hormones; and nutrition, including effects of quick-freezing on the vitamin content of strawberries,

red raspberries, and blueberries, effect of freezing and dehydration on the carotene content of squash, culinary and preserving qualities of New Hampshire fruits and vegetables, nutrition studies with lactating cows, effect of vitamin A on utilization of energy and protein by calves, and studies of the metabolism of the horse.

Fifty-seventh Annual Report [of Cornell Station], 1944, W. I. MYERS ET AL. (Partly coop. U. S. D. A.). ([New York] Cornell Sta. Rpt. 1944, pp. 82-180).—In addition to work noted elsewhere in this issue, this section of the report deals with the progress of investigations in agricultural economics, including prices for dairy products, farm-labor simplification, costs and returns on dairy farms, organization of farms in Wayne County, and rural-urban problems in the Elmira-Corning industrial region; agricultural engineering, including the curing of hay in the mow; agronomy, including the physicochemical properties of New York soils and their fertilization, birds-foot-trefoil investigations, potash requirements of leguminous forage crops, plant associations for pastures, methods of hay production and preservation, and methods for improving the quality and economy of production of feed crops; animal husbandry, including the effect of dietary fat levels on milk and fat production, nutritional requirements of herbivora, relative efficiency of animals in producing human food, hormonal control of the reproductive cycle in cattle, artificial insemination of farm animals, quality and palatability of beef from pasture v. grain feeding, methods for fattening yearling steers, protein requirements and supplements for lambs and pigs, the cause of stiff-lamb disease, and finishing pasture-fed pigs in dry lot; botany, including the yam bean as an insecticidal plant, plant sources of rubber, time of day for cutting forage crops, studies of tetraploid red clover and iris, and germination of spores of *Lycopodium*; dairy industry, including vitamin A content of butter, cheese making, oxidation of milk fat, production of B vitamins, *Streptococcus* food poisoning, stability of carotene solutions, sugars in food products, flavors and storage problems, cytology of bacteria, disinfection studies, the nutrition of bacteria, and the streptococci of subacute bacterial endocarditis; entomology and limnology, including studies of the alfalfa snout-beetle, white grubs, the use of sprays and dusts in apple insect control, chemistry and toxicity of the yam bean, honeybee poisoning by blossom-thinning sprays, life history and control of the squash bug and the seed corn maggot, use of methyl bromide and other grain fumigants in small storages, control of lice and ticks, prevention of flea-beetle injury on tomato, control of the European chafer (coop. N. Y. State Expt. Sta.), lettuce yellows, insects attacking potato foliage and tubers; floriculture and ornamental horticulture, including studies of *Daphne cneorum* as a spring pot plant, callus and root formation in woody cuttings, dormancy and bud formation of roses, and seed dormancy in cabbage; plant breeding, including studies of corn, wheat, barley, oats, rye, soybeans, field and garden beans, celery, clovers for hay, potatoes, muskmelons, and cucumbers; plant pathology, including studies of scab, Rhizoctonia, bacterial wilt and ring rot, pitting, viruses, and disease-resistant stocks of potatoes, onion smut, tree wound protectants, peach cankers, virus diseases of cherries, and soil fumigants; pomology, including studies on the basal metabolism rate in apple varieties, effect of controlled atmosphere storage on the keeping quality of apples and grapes, relation to apples in storage of leaf nitrogen, low temperatures, and wraps and waxes, influence on fruit tree nutrition of sulfur sprays, ammonium sulfate fertilization, soil oxygen and carbon dioxide, growth-modifying chemicals, blossom sprays and fruit thinning, mulch material, and pruning; poultry husbandry, including genetic resistance to diseases, mutations and linkage, eggshell color in crosses, requirements for the vitamin B complex, utilization by the chick of phosphorus, functions of manganese, protein substitutes in feeding stuffs, feeding value of choline and milk byproducts, poultry pastures, early detection of infertile eggs, methods of accelerating embryonic devel-

opment, and studies of preserving eggs; rural sociology, including studies of rural youth in low-income agricultural areas, social participation of rural families, and families displaced in a Federal submarginal-land-purchase program; vegetable crops, including fertilizer requirements, variety tests, handling and storage of carrots, diurnal and seasonal changes in the vitamin C and carbohydrate content, chemical composition and culinary quality of potato tubers, irrigation studies, factors affecting premature heading of cauliflower, reproductive development in celery, and effects of fertilizer on field beans; and zoology, including studies of zinc phosphide as a rodenticide, repellents for rabbit injury, control of starlings, and studies on the cyclic nature of small-animal populations.

Fifty-fifth and Fifty-sixth Annual Reports [of Tennessee Station], 1942, 1943, [C. A. MOOERS ET AL.]. (Partly coop. U. S. D. A.). (*Tennessee Sta Rpt. 1942*, pp. 111, illus. 44; 1943, pp. 115, illus. 33).—In the report for 1942, progress results are noted in agronomy, including variety trials with castor-beans, soybeans, oats, Sudan grass, cotton, barley, grasses, corn, and potatoes, and fertilizer tests with potatoes; animal husbandry, including a comparison of corn silage v. sorghum silage for fattening steers, high-phosphorus v. low-phosphorus red clover hay for wintering beef calves, phosphate utilization by rats and calves, use of pasture in beef and pullet production, types of ewes for spring lamb production, dehydrated sweetpotatoes v. corn cob shuck meal for fattening steers, and fertility and growth studies with poultry; dairy husbandry, including studies of legume silage for dairy cows and poultry, milk flavors on winter pasture, and matting of cottage cheese; chemistry, including studies of dehydrated and frozen foods, composition of soybean-sweetpotato silage, the oil and press cake meal from pumpkin seed, boron fertilization of legumes, fertilizing value of wood ashes, effect of continued nitrogen carriers on soils, erosion control studies, decomposition of calcium and magnesium carbonate in soils, lime-potash and lime-phosphate studies, conservation of soil sulfur, availability of ammonium nitrogen, and utilization of a quenched calcium silicate slag and various phosphatic materials; economics and sociology, including studies of agricultural adjustments in various regions, farm taxation, cotton marketing, and haying practices; engineering, including designs for a small brooder and laying house for backyard poultry, an impact mill, a commercial castor-bean sheller, plywood silos, irrigation sprinklers and other equipment, and a soil sampler; entomology, including studies of roach powders and the toxicity of volatile fluorine compounds; home economics, including ascorbic acid studies; horticulture, including the improvement of beans, soybeans, sweetpotatoes, tomatoes, and rhubarb (for crown-rot resistance), use of electric hot beds in vegetable growing, development of blight-resistant pears and chestnuts, planting dates for potatoes, strawberry and raspberry breeding, culture of sage and tomatoes (transplanting methods), gladiolus varieties, and irrigation of pole beans; fiber research, including studies on properties, fineness, and strength; plant pathology, including diseases of corn, cotton, red clover, strawberry, tobacco, tomato, watermelon, and wheat; and at the substations studies of grain and alfalfa culture, variety tests of cereals, soybeans, and sorghums, effect of shade on pasture, and a borax test with alfalfa; tobacco (crop rotations, fertilization, and curing), pasture studies, and silage preservatives.

In the report for 1943, progress results are reported in agronomy, including cultural studies with castor-beans, soybeans, and hemp, breeding studies with corn and grasses, time of seeding oats, phosphate comparisons, improvement of cotton, oats, and barley, pasture and broadcast crops to prevent erosion, and the physical properties of cotton fiber; agricultural engineering, including irrigation equipment, plywood silos, and a liquid fertilizer distributor; animal husbandry, including studies of corn silage v. sorghum silage for fattening steers, chopped sweetpotatoes for

fattening cattle, once-daily v. twice-daily feeding of fattening cattle, growth and reproduction in beef cattle as influenced by phosphates, types of ewes for spring lamb production, pasture v. pasture plus grain for finishing yearling heifers, fused tricalcium phosphate as an animal feed supplement for rats, and effect of iron and aluminum compounds in hays on phosphorus utilization; dairying, including studies of off-flavor in milk and butter; poultry husbandry, including pasture studies, legume silage for breeding hens, and influence of time of insemination on fertility and hatchability; chemistry, including lysimeter studies of liming materials, effect of heavy liming on absorbed potassium in the soil leachates, comparison of potassium sulfate and potassium metaphosphate, and lime-phosphate studies, and methods for the determination of the neutralization values of calcium silicate slags; chemistry, including studies of frozen and dehydrated foods, soybean sirup, legume silage, fruit juice concentrates, dehydrated sweetpotatoes, and utilization of cottonseed hulls in plastics, borax fertilization of legumes, high- v. low-phosphate fertilization, and curing of Korean lespedeza hay; economics and sociology, including agricultural adjustments, types of farming, farm taxation, and cotton marketing; entomology, including studies of fluorine compounds as insecticides, and the control of bean insects; home economics, including ascorbic acid studies; horticulture, including the improvement of strawberries, lime beans, broccoli, cabbage, beets, sweetpotatoes, peas, tomatoes, pears, sweet corn, and gladioli, the culture of asparagus, bush beans, sage, tomatoes, and brambles, and erosion control in the production of truck crops; plant pathology, including studies of wilt-resistance in watermelons and tomatoes and breeding of tobacco for mosaic resistance; and at the substations, the home production of food supplies, dates of seeding ryegrass, oats, and rye, variety tests with wheat, oats, barley, and alfalfa, tobacco studies (fertilizers, rotations, and varieties), sod crops for erosion control, alfalfa v. sericea hay for wintering calves and steers and as silage, and seeding practices for alfalfa and crimson clover.

Research serves agriculture: Fifty-seventh Annual Report [of the Texas Station], 1944, C. H. McDOWELL ET AL. (*Texas Sta. Rpt. 1944, pp. 49, illus. 65*).—This report mentions and illustrates "a few of the latest accomplishments and services." Among these are the need of body balance for successful mating in the Broad-Breasted turkey; protein, trace mineral, and vitamin requirements for growing chickens; need of vitamin A in poultry feed; feed requirements and cost of producing broilers; control of liver flukes in cattle by a hexachloroethane-bentonite suspension; studies of the cause of keratitis or "pink eye" of cattle; use of phosphate fertilizers to increase beef production; development of methods for the determination of essential amino acids; mechanical harvesting of cotton; mesquite eradication; dehydration of vegetables and Magnolia (Brunswick) figs; development of Emerald sweetclover and sweet Sudan grass; breeding new types of Rhodes grass resistant to lower temperatures; new types of grain sorghum suitable for combine harvesting; use of vetch and other legumes to increase the yield of cotton and corn; breeding small grains for rust resistance; the combine harvesting and drying of rough rice; new berry crosses and selections; development of a new strain of Grano onion and of a cantaloup resistant to mildew and aphids; development of a sulfur-copper fungicidal dust; and studies of potential essential oil crops for east Texas.

MISCELLANEOUS

Partial list of United States farm papers received in the U. S. Department of Agriculture Library (*U. S. Dept. Agr., Libr. List 18 (1945), pp. 6*).—This list is arranged by States. State and county farm bureau and State college papers are not included.

Dairy Research Digest [September 1945] (*Dairy Res. Digest* [Louisiana Sta.], 3 (1945), No. 3, pp. 4).—In addition to brief articles noted elsewhere in this issue or previously, this number contains Vitamin C Added to Milk, by F. J. Doan (p. 3); Alfalfa Hay Alone Not Sufficient for Young Bulls, by I. R. Jones, R. W. Dougherty, and J. R. Haag (p. 3); The Blood Picture in Normal and Milk Fever Cows, by J. W. Hills et al. (p. 3); Why Strippings Are the Richest Milk, by C. W. Turner (p. 4); and Perennial Lespedeza Less Valuable Than Annual Types (p. 4).

Der erfolgreiche Pflanzer: Wir Schweizer als Selbstversorger [The successful planter: We Swiss as self-supported], edited by J. I. KUNZ (*Olten, Switz.: Verlag Otto Walter, 1944, 5. ed., rev. and enl., pp. 788, over 500 illus.*).—This is a compendium of information on Swiss agriculture, including vegetable culture—the small garden and truck farming, preparation and marketing of vegetables, and control of their pests and diseases; field crops—corn and small grains, potatoes, and special crops; seed production; orchard and small fruits and the control of their most important pests and diseases; fruits and berries in human nutrition; and the raising of small animals, including poultry and rabbits. An appendix considers rotations and cover crops in vegetable gardening. A detailed table of contents and a subject index are provided.

A note-book of tropical agriculture, R. C. WOOD (*Trinidad, B. W. I.: Imp. Col. Trop. Agr., 1945, 3. ed., pp. 147+, several illus.*).—This practical handbook discusses such matters as weights and measures, surveying, buildings and roads, machinery, labor, soils, manures, crops, foods and feeding, livestock, dairying, farm formulas, statistics, and institutions of service to farmers in the Tropics.

NOTES

Connecticut University and Storrs Station.—Ground has been broken for a modern \$80,000 greenhouse range to be equipped with automatic heat and ventilation controls and various types of benches and beds for subirrigation and sand culture. The facilities will be available for research in floriculture, vegetable gardening, and agronomy.

The resignations are noted of Dr. J. C. Shaw, associate professor and research associate in dairy industry, to become professor of dairy husbandry in the University of Maryland, and of Dr. M. L. Gabriel and H. W. Seeley, Jr., research assistants, respectively, in genetics and dairy industry. Dr. Nathan L. Whetten, rural sociologist and dean of the graduate school, has returned from 2 years' leave of absence in Mexico, where he carried on special research for the State Department. Dr. Erwin Jungherr, professor of animal diseases and animal pathologist, has received the Borden award of \$1,000 for his research on poultry diseases.

Illinois University and Station.—J. C. Anderson and Frank Simpson, assistants, respectively, in soil fertility and animal nutrition, have been given emeritus status. J. H. Hetrick, associate in dairy manufactures, Dr. Cleo Fitzsimmons, assistant professor and assistant chief in home economics, Dr. Jean I. Simpson, associate professor and associate chief in home economics, Dr. M. B. Hughes, assistant chief in horticulture, O. E. Bolin, assistant professor and assistant chief in plant genetics, J. F. Gwinn, assistant in agricultural engineering, and Helen B. Guptill and Janet L. Retzer, assistants in home economics, have resigned.

Dr. Robert Graham, head of the department of animal pathology and hygiene, has been appointed dean of the newly established College of Veterinary Medicine. Other appointments include Dr. R. W. Jugenheimer as associate professor and associate chief in plant genetics, F. C. Francis as assistant professor and assistant chief in animal husbandry, Helen M. Wiseman as instructor and assistant in home economics, and J. B. Fehrenbacher, Martha G. Hubbard, and Mildred K. Wellman as assistants in soil physics, animal husbandry, and home economics, respectively.

Iowa College and Station.—Under an act of Congress signed by President Truman on October 18, 1945, the Secretary of Agriculture is directed to convey to the State of Iowa the premises on the college campus transferred from the State to the United States in 1934, including the laboratory building which the Government has erected thereon for farm-waste investigations.

Thomas J. Maney, research professor and head of the station subsection of pomology since 1917, died October 12, 1945, aged 57 years. A native of Geneva, N. Y., he was graduated from the college in 1912 and had subsequently continued in its service. Much of his research had been with potatoes, orchard fruits, grapes, and strawberries.

Dr. E. W. Lindstrom, head of the department of genetics, has returned from a year in Colombia as a visiting professor in the Facultad Nacional de Agronomia. Dr. W. F. Buchholtz, plant pathologist in the South Dakota Station, has returned as associate professor of botany in the college and research associate in botany and plant pathology in the station.

Massachusetts College and Station.—An Aberdeen-Angus herd has been started following a number of gifts from individuals.

Dr. Carl R. Fellers, head of the department of food technology, has returned after about 4 years in the military service in which he assisted in the organization and operation of the allied food production programs in Australia and New Zealand.

In this connection the Australian Commonwealth has appropriated funds for the establishment of a full university course in food technology.

Michigan College and Station.—Dr. H. J. Stafseth, professor of pathogenic bacteriology, has been granted a year's leave of absence to head a delegation of veterinarians being sent to China by UNRRA and to act as veterinary adviser to the Chinese Government. One of the objects of the mission will be to develop a national veterinary service in China, a nation with a population of over 400,000,000 people and said to have only 14 trained veterinarians.

Minnesota University and Station.—Dr. Rodney B. Harvey, professor of plant physiology and head of this section, died November 4, 1945, at the age of 55 years. A native of Indiana and a graduate of Purdue University in 1912, he received the Ph. D. degree from the University of Chicago in 1918. Following appointments with the Bureaus of Chemistry and Plant Industry of the U. S. Department of Agriculture, he came to Minnesota in 1920 as assistant professor of plant physiology and later also served as director of the Florida Citrus Substation in 1936-37. He had also held numerous offices in the American Society of Plant Physiologists, including that of president in 1936.

Montana College and Station.—E. R. Halbrook, extension assistant professor of poultry husbandry in the Kansas College, has been appointed head of the department of poultry husbandry.

New Jersey Stations.—Dr. Charles S. Cathcart, chemist and State chemist since 1907, died December 9, 1945, in his eighty-first year. A native of New Brunswick, N. J., and a graduate of Rutgers University in 1886 (M. S. 1889), he had also served as assistant chemist in the station from 1890 to 1892 and was for many years engaged in commercial work.

Cornell University and Station.—Dr. W. L. Williams, widely known for his pioneer services in veterinary education and his many contributions to veterinary surgery and diseases of reproduction, died in his ninetieth year on October 23, 1945. His professional career extended over 66 years, of which 2 years was as professor of veterinary science in Purdue University, 3 years in the same capacity in the Montana College, and 49 years at Cornell as professor and professor emeritus. He was the author of *Surgical Obstetrical Operations*, published in 1907 and still in use, *Veterinary Obstetrics*, and many other books and articles. He served as president of the American Veterinary Medical Association in 1892.

Dr. C. D. Knodt and J. S. Taylor have resigned as instructor and extension instructor in animal husbandry to accept positions in the Pennsylvania College. Blanche Fickle has been appointed research associate in institution management.

New York State Station.—Dr. F. W. Hayward has resigned as investigator in the division of food science and technology to accept an appointment as research associate in foods in the Industrial and Research Institute of the University of Chattanooga.

Oklahoma College and Station.—George T. Davis, field assistant in poultry improvement in the Kentucky Station, has returned to Oklahoma as assistant professor of poultry husbandry. K. B. Ellis has been appointed assistant in poultry husbandry.

South Dakota Station.—Dr. Frank G. Viets, Jr., has resigned as assistant agricultural chemist to become agronomist in the U. S. Department of Agriculture, with headquarters at the Irrigation Substation of the Washington Station.

Dr. Louis W. Holm has been appointed assistant agricultural biochemist.

Washington College and Station.—A tract of 108 acres adjoining the college farm has been purchased to increase the research facilities.

Dr. Lillian S. Bentley has been appointed assistant professor and assistant in research in home economics. Dr. Seth B. Locke, assistant research professor in the

Rhode Island Station, has been appointed assistant professor and associate plant pathologist vice Dr. L. K. Jones, resigned. W. E. Ham, assistant agricultural chemist in the Nebraska Station, has been appointed instructor and assistant in animal husbandry; Edwin A. Kline, instructor and assistant in animal husbandry; W. W. Hinz, instructor and assistant in agricultural engineering; and Dr. Frederick A. Hunter, junior veterinarian. Other appointments include the following assistants—Martin W. Carstens in horticulture, with headquarters at the Western Washington Station vice Dr. T. E. Randall, who has been given charge of the Vegetable Seed Production Laboratory at Mt. Vernon; J. Frank Cone and James N. Reynolds in dairy husbandry; Paul M. Eide of the U. S. D. A. Bureau of Entomology and Plant Quarantine in entomology; L. L. Stitt in entomology, with headquarters at the Western Washington Station; George H. Foster in agricultural engineering; Dr. William B. Fox and Shirley Kellenbarger in agronomy vice William H. Harvey and Darrell E. Wales; and W. W. Heinemann in animal and dairy husbandry, with headquarters at the Irrigation Substation.

Wisconsin University.—Funds have been allocated from the State's building appropriation of \$8,000,000 for a new dairy building to cost \$600,000 and a \$280,000 addition to the home economics building.

Necrology.—George M. Rommel, associated with the animal husbandry work of the U. S. Department of Agriculture from 1901 to 1921, the last 15 years as chief of the animal husbandry division of the Bureau of Animal Industry, died in Chattanooga, Tenn., on November 26, 1945, in his seventieth year. A native of Iowa, he was graduated in turn from Iowa Wesleyan and Iowa State Colleges and served as assistant animal husbandman in the latter institution from 1899 to 1901. He had also held numerous commercial positions and had much experience as an agricultural consultant, lecturer, and writer. From 1933 until his retirement in 1944 he was supervisor of agricultural investigations and experiments for the Tennessee Valley Authority.

Dr. Theodore H. Frison, associated with the Illinois Natural History Survey since 1923 and its chief since 1931, died on December 9, 1945, in his fifty-first year. A native of Illinois, he was graduated from the University of Illinois in 1918 and received the Ph. D. degree there in 1921. He had served as assistant State entomologist in Wisconsin in 1920, assistant entomologist in the U. S. Department of Agriculture in 1921–22, and as assistant entomologist in the Illinois Station in 1922–23. He had written many entomological articles, notably on the bumblebees and stoneflies, and was editor of the *Journal of Economic Entomology* from 1936 to 1940.

Walter H. Beal, prominently identified with the work of the Office of Experiment Stations, U. S. Department of Agriculture, from 1891 until his retirement in 1938, died on January 1, 1946, in his seventy-ninth year. A brief editorial note on his services appeared in the *Record* at the time of his retirement (E. S. R., 79, p. 147). Since that time he had continued to make his home in Washington, D. C.

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RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY AND MICROTECHNIC

Major instruments of science and their applications to chemistry, edited by R. E. BURK and O. GRUMMITT (*New York 3: Interscience Pubs., 1945, pp. 149+, over 100 illus.*).—The methods and instruments here dealt with are adequately indicated in the table of contents, in part as follows: Electron Diffraction and the Examination of Surfaces (introduction, experimental method, fields of usefulness of electron diffraction, electron-diffraction studies, and bibliography), by L. H. Germer (pp. 1-15); The Electron Microscope and Its Applications (theory of the apparatus, construction, applications, and bibliography), by L. Marton (pp. 17-40); X-Ray Diffraction and Its Applications (introduction, experimental methods, methods of structure determination, applications other than structure determination, the structures of typical elements, the structures of some simple inorganic compounds, the structures of some more complex inorganic compounds, the structures of some organic compounds, and bibliography), by M. L. Huggins (pp. 41-68); Chemical Spectroscopy (radiant energy, chemical analysis by emission spectra, and bibliography) (pp. 69-95), and Application of Absorption Spectra to Chemical Problems (nomenclature, absorption and resonance, and bibliography) (pp. 97-122), both by W. R. Brode (Ohio State Univ.); and The Infrared Spectrometer and Its Application, by R. B. Barnes (pp. 123-147).

Simplified ultraviolet microscopy, G. I. LAVIN (*Rev. Sci. Instruments, 14 (1943), No. 12, pp. 375-376, illus. 2; also in Rockefeller Inst. Med. Res. Studies, 125 (1944), pp. 205-207, illus. 2*).—"A simplified technic for ultraviolet microscopy employing the 2537A mercury line as the light source is described. The line is isolated by means of a liquid filter composed of an aqueous solution of nickel sulfate and cobalt sulfate." A willemite screen permits focus of the microscope with ultraviolet light of the wave-length used in making the exposure. "The plate when dry does not flake off, but rubs off very easily. Screens made with a binder have so far not been as sensitive as the one . . . described."

¹The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied on request.

A model of the potassium effect, W. J. V. OSTERHOUT (*Jour. Gen. Physiol.*, 27 (1943), No. 2, pp. 91-100; also in *Rockefeller Inst. Med. Res. Studies*, 125 (1944), pp. 191-200).—The author found that when molar potassium chloride in contact with nitrobenzene which had previously been shaken with molar potassium chloride was replaced by molar sodium chloride the potential rose 67 mv., a value comparable with that observed in *Nitella*. This was not due to a mobility of the potassium ion in nitrobenzene greater than that of the sodium ion, as was shown by measurements of concentration effects in nitrobenzene.

"Measurements with salicylates showed that K-salicylate has a partition coefficient about 11.7 times as great as that of Na-salicylate. It was also found that when M/1 K-salicylate in contact with nitrobenzene (previously shaken with N/1 K-salicylate) is replaced by M/1 Na-salicylate there is a change of potential in a positive direction amounting to 56 mv."

The nitrogenous constituents of flaxseed.—II, The isolation of a purified protein fraction, B. VASSEL and L. L. NESBITT. (N. Dak. Expt. Sta.). (*Jour. Biol. Chem.*, 159 (1945), No. 3, pp. 571-584, illus. 2).—This paper reports upon the isolation of a protein fraction designated "linin" and its separation, by a technic involving the use of organic solvents, from a small proportion of gummy substances extracted with the proteins from the seed. A second protein fraction, "conlinin," was also obtained. Other proteins were found to be present in small quantities.

By extracting fat-free linseed meal with a mixture of pH 7.2 phosphate buffer solution and ethylene glycol, centrifuging, bringing the pH to 10 to 10.2 with sodium hydroxide, and adding to the alkaline solution equal volumes first of water and then of dioxane, a considerable part of the gummy material was slowly precipitated. After removal of this precipitate, the proteins were precipitated at pH 4.5 and redissolved in water and dioxane at pH 10.1 to 10.2. Further gummy material was precipitated and removed. The proteins (linin and conlinin) were again precipitated, redissolved in water brought to pH 10.2, and fractionally reprecipitated. Linin was separated at pH 5.7, conlinin at pH 4.5. A possible further purification of linin, by solution in 87 percent formic acid and reprecipitation by dilution with an equal volume of water, is also described.

Colloidal aspects of dough, C. O. SWANSON. (Kans. State Col.). (*Bakers Digest*, 18 (1944), No. 5, pp. 17-19, 30, illus. 1).—The author presents an elementary outline of the nature of the colloidal state, followed by a brief explanation of the colloidal behavior involved in the formation and properties of a dough.

The occurrence of dicholesteryl ether in the spinal cord of the ox (*Bos taurus*), H. SILBERMAN and S. SILBERMAN-MARTYNCEWA (*Jour. Biol. Chem.*, 159 (1945), No. 3, pp. 603-604).—The authors found that when spinal cord was substituted for the brain of the animal as the starting material in preparing cholesterol, repeated recrystallization from hot alcohol failed to effect the purification easily attained when brain was used as starting material. The persistent impurity which caused abnormal behavior in melting point determinations was found to be dicholesteryl ether. Removal of the cholesterol by treatment with acetone, followed by a washing with ether, left a residue which could be recrystallized from hot benzene and identified by melting point, elementary analysis, and properties of its tetrabromide, as dicholesteryl ether, present to the extent of about 1.5 to 2 percent of the dry starting material. The authors found no record of the previous isolation of this compound from natural sources.

Retention of carotene in alfalfa stored in atmospheres of low oxygen content, E. J. HOFFMAN, F. G. LUM, and A. L. PITMAN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 8, pp. 361-373, illus. 5).—It was concluded that the most effective conservation of carotene in alfalfa commercially by means in inert gas would be accomplished by the highest possible exclusion of air throughout the entire

storage period. The extent to which oxygen can be excluded from the storage atmosphere economically in commercial practice remains to be investigated. It would appear that the permissible oxygen content of the storage atmosphere at the beginning will be somewhat less than 3 percent.

The cis-trans isomerization of α -carotene isomers, H. A. NASH and F. P. ZSCHEILE. (Ind. Expt. Sta.). (*Arch. Biochem.*, 5 (1944), No. 1, pp. 77-88, illus. 3).—Members of the α -carotene stereoisomeric set obtained by heat treatment (refluxing in the dark for 18 hr. in hexane at 65° C. or in isooctane at 99°) and by iodine-light treatment of crystalline α -carotene (chromatographically and spectroscopically pure) were separated chromatographically and subjected to spectographic study. Spectral absorption curves in the visible region are presented for the isomers, the coincident points of the curves with that of the all-trans isomer being established by isomerization methods. Ultraviolet data on the cis-peak were obtained for several isomers. Almost exactly the same chromatographic picture was obtained from the iodine-light isomerization mixtures as from 99° heat isomerization mixtures. Approximate yields of the individual α -carotene isomers, namely, neo U, V, W, neo X, all-trans, neo B, neo C, neo C', neo D, neo E, and unidentified, obtained by heat and iodine-light treatments of different isomers as starting materials, are reported. The effect of temperature on yields of the isomers was shown to be important, particularly in the demonstration of relative stability of and structural relationships among certain isomers.

Destruction of certain vitamins and pigments by nitrous acid, J. K. WILSON ([New York] *Cornell Sta. Mem.* 271 (1945), pp. 6).—The color of a light-petroleum extract of carotene, purified by the adsorption column ("chromatograph") method, was decolorized within 1 min. when made acid with acetic acid and shaken with a sodium nitrite solution. A like solution containing xanthophyll and probably other pigments, similarly treated with a small proportion of 1 percent sodium nitrite solution, lost about four-fifths of its color in 20 min. Water of exudation collected from *Agrostis tenuis* (bentgrass) and found to contain about 1 p. p. m. of nitrite gave no further test for nitrites 10 min. after addition of about 50 p. p. m. of ascorbic acid.

The significance of these observations as related to losses of vitamins, pigments, and nitrogen from crops and silages is discussed, together with reduction of palatability and nutritional value. It is concluded that crops containing nitrate when placed in a silo may lose some of their vitamins and nitrogen through oxidation by nitrous acid.

Transamination in bacteria, H. C. LICHSTEIN and P. P. COHEN. (Univ. Wis.). (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 85-91, illus. 4).—For the transamination reaction $l(+)$ -glutamic acid + oxalacetic acid \rightarrow α -ketoglutaric acid + $l(-)$ -aspartic acid, studied in several bacterial species, the optimal pH in *Bacillus coli* was found to lie at about 8.5, and the optimal temperature appeared to be 32° [C.]. Q_{TN} values ($Q_{TN} = \frac{\text{microliters aspartic acid formed}}{\text{mg N} \times \text{hours}}$) for 12 organisms are presented. All were of a high order of magnitude. Optimal Q_{TN} values for *B. coli* exceeded those reported for animal tissues.

Terminology of nucleic acids, A. W. POLLISTER and A. E. MIESKY (*Nature* [London], 152 (1943), No. 3867, pp. 692-693; also in *Rockefeller Inst. Med. Res. Studies*, 125 (1944), pp. 387-388).—The authors "suggest that chromonucleic acid be used instead of 'thymus nucleic acid' as a biological term for the substance described chemically by the term 'desoxyribose nucleic acid.' It is now certain that the ribose nucleic acid, by contrast, is found either in the cell cytoplasm or in the plasmosome (nucleolus) of the cell nucleus; it is not a constituent of the nuclear chromatin itself. We therefore suggest 'plasmonucleic' acid as a useful substitute

for 'yeast nucleic acid' and as the biological equivalent for the chemical term 'ribose nucleic acid.'"

New anhydrides of peptides and dehydrogenated peptides, J. E. TIETZMAN, D. G. DOHERTY, and M. BERGMANN (*Jour. Biol. Chem.*, 151 (1943), No. 2, pp. 387-394; also in *Rockefeller Inst. Med. Res. Studies*, 125 (1944), pp. 19-26).—"The transformation of dehydrogenated peptides into anhydrides was observed in three instances. In the first of these, acetyldehydrophenylalanyldehydrophenylalanine (I) (1) was heated with a water-pyridine mixture at 90° [C.] for 4 hr. Under these conditions 1 molecule of water was split off, and a solution of the pyridine salt of an anhydride was formed." The conditions and products of this and of the two other instances of anhydride formation are set forth in some detail.

Reversibility of the phosphoroclastic split of pyruvate, M. F. UTTER, F. LIPMANN, and C. H. WERKMAN. (Iowa Expt. Sta. et al.). (*Jour. Biol. Chem.*, 158 (1945), No. 2, pp. 521-531).—The authors found that when pyruvic acid is dissimilated by *Escherichia coli* extract in the presence of $\text{HC}^{\text{14}}\text{OOH}$, the residual pyruvate contains excess C^{14} in the carboxyl group, indicating reversibility of the pyruvate split. Addition of inorganic phosphate to dialyzed *E. coli* extract increased the rate of exchange. When pyruvic acid was broken down in the presence of $\text{CH}_3\text{C}^{\text{14}}\text{OOH}$ and of adenylyl pyrophosphate, the residual pyruvate contained excess of C^{14} in the carbonyl group. Intact cells of *E. coli* acting upon pyruvic acid in the presence of $\text{NaHC}^{\text{14}}\text{O}_2$ fixed C^{14} in the carboxyl group of pyruvic acid.

A phosphorylated derivative of pyridoxal as the coenzyme of tyrosine decarboxylase, I. C. GUNSALUS, W. D. BELLAMY, and W. W. UMBREIT. (Cornell Univ.). (*Jour. Biol. Chem.*, 155 (1944), No. 2, pp. 685-686).—The authors obtained from *Streptococcus faecalis* R grown in a medium deficient in "pseudopyridoxine" a dried cell enzyme preparation which decarboxylates tyrosine very slowly, is slightly stimulated by the addition of pyridoxal, but is markedly stimulated if supplied with pyridoxal and adenosine triphosphate. Adenosine triphosphate supplied without pyridoxal had little effect (or was slightly inhibitory), and addition of muscle adenylic acid plus pyridoxal did not increase the rate above that with pyridoxal alone. The stimulation of tyrosine decarboxylation upon the addition of pyridoxal to living cells was attributed to the availability of adenosine triphosphate. It was then shown that treatment of pyridoxal with thionyl chloride and the removal of the substituted chlorine with silver dihydrogen phosphate yielded a material which possessed coenzyme activity for tyrosine decarboxylase in the absence of adenosine triphosphate. Similarly, an active compound could be synthesized by treatment of pyridoxal with phosphoric acid in the cold.

Removal of canavanine from preparations of jack bean urease, R. M. ARCHIBALD and P. B. HAMILTON (*Jour. Biol. Chem.*, 150 (1943), No. 1, pp. 155-158; also in *Rockefeller Inst. Med. Res. Studies*, 125 (1944), pp. 321-324).—A uniform paste is made with 20 gm. of a commercial preparation of urease and water and is made up to 50 cc. with water. Centrifugation at 2,000 r. p. m. for 2 min. removes 0.38 gm. of insoluble material. The supernatant is dialyzed at 0° [C.] in commercial cellulose sausage casing against 2 l. of distilled water (with rocking, and with a marble in the sac for stirring) for 6 to 8 hr. Six subsequent dialyses of 6 to 8 hr. each against 2 l. of 0.001 M phosphate of pH 6.5 reduce the amino acid content to minimal values. The urease solution is then frozen and thoroughly dried in a vacuum while frozen. The resulting powder is readily soluble in water and its urease activity per milligram is of the same order as that of the starting material. Approximately 50 percent of the weight of commercial preparation of urease passes through the membrane. Analyses of two typical preparations are tabulated. The procedure described was found to remove canavanine and other proteins almost completely.

Isolation of lysozyme from egg white, G. ALDERTON, W. H. WARD, and H. L. FEVOLD. (U. S. D. A.). (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 43-58, illus. 4).—A method for the isolation of lysozyme from egg white, in high yield and in essentially pure form, depends on the (1) adsorption of lysozyme on bentonite (a montmorillonite clay), (2) elution of inactive contaminating proteins from the clay by successive washings with phosphate buffer (pH 7 to 8) and 5 percent aqueous pyridine, and (3) elution of the active material with pyridine-sulfuric acid solution at pH 5.0. The eluate, dialyzed and dried in the frozen state, yields a white powder containing 85 to 90 percent of the lysozyme of the egg white. Crystallization was effected at the isoelectric region (pH 10.8), at pH 7.0, and in acid solutions (pH 3.5 to 5.0). The crystal form appears to vary, depending on the pH of crystallization and the acid used in dissolving the protein.

The lysozyme preparations were indicated to be essentially pure by salt fractionation, by their behavior toward enzymes, and by electrophoretic and sedimentation studies. Lysozyme was found to be a basic protein of relatively low molecular weight (about 17,000), isoelectric at a point between pH 10.5 and 11. The purified substances was stable in acidified solutions. At pH 11.5 no loss of activity was detected over a period of 5 to 6 hr.

The specificity of the leucine, isoleucine, and valine requirements of *Lactobacillus arabinosus* 17-5, D. M. HEGSTED (*Jour. Biol. Chem.*, 157 (1945), No. 2, pp. 741-746, illus. 1).—The isomers of leucine, isoleucine, and valine and various derivatives of these amino acids were tested for their ability to replace these amino acids in the nutrition of *L. arabinosus*. It was found that in the absence of *l*(+)-leucine, *d*(-)-leucine allows some growth, although the rate is much below normal. Similarly, *l*(+)-alloisoleucine was capable of replacing isoleucine partially. Isoleucine was effectively replaced, valine partially, and leucine not at all by the corresponding α -hydroxy acids. Of the acetyl derivatives only acetyl-leucine was active. All three of the α -keto acids were found active, although they had not been measured quantitatively except α -ketoisocaproic acid, which was one-half as active as *l*(+)-leucine.

On the utilization of raffinose by *Pseudomonas saccharophila*, M. DOUDOROFF. (Univ. Calif.). (*Jour. Biol. Chem.*, 157 (1945), No. 2, pp. 699-706).—Intact cells of *P. saccharophila* grown with raffinose as substrate could oxidize raffinose and sucrose more rapidly than melibiose or any of the hexose constituents of raffinose separately or together, provided the compounds were made available in low concentration. When supplied in high concentration, melibiose was utilized very rapidly, while the monosaccharides were oxidized relatively slowly. Practically no hydrolytic or phosphorolytic enzymes catalyzing the break-down of raffinose, melibiose, or sucrose were found in the medium after bacterial growth had taken place. The presence of an active intracellular melibiase was demonstrated in a study of dry cell preparations. In addition, the cells contained invertase and a phosphorylase which was active towards sucrose but not towards raffinose. No direct phosphorolysis of either raffinose or melibiose could be shown. The occurrence of phosphorolysis *in vivo* was indicated by the demonstration of a phosphoric ester having the properties of glucose-1-phosphate in respiring cells. Semiquantitative estimation of this compound substantiated the view that it originates mainly through the action of sucrose-phosphorylase. There was no evidence for a phosphorolytic break-down of melibiose *in vivo*.

Substances adsorbed on the fat globules in cream and their relation to churning—VI, Relation of the high-melting triglyceride fraction to butterfat and the "membrane," R. JENNESS and L. S. PALMER. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 9, pp. 653-658).—Extending this series of investigations (E. S. R., 93, p. 763), the authors obtained high-melting triglyceride fractions of

rather similar properties from butterfat, washed-cream buttermilk extracts, and washed-cream butter-serum extracts by crystallization from ethanol. Fractions twice crystallized from ethanol had iodine numbers of 5.0-7.1, saponification numbers of 198.8-204.0, and melting points of 52°-53° C. Yields of this material from buttermilk extract were similar to those from butterfat solutions of like concentration, but the yield from butter-serum extracts was invariably much greater. The significance of this observation is discussed.

As ceras no Brasil e o licuri Cocos coronata Mart, na Bahia [Waxes in Brazil and the Licuri [a palm] Cocos coronata], G. BONDAR (*Inst. Cent. Fomento Econ. Bahia, Bol. 11 (1942), pp. 86+*, illus. 18).—An introduction points out that although the Licuri tree found place in the Bahia economy as an oil producer for the first time in 1917 with a production of 400 bags of oil seeds, increasing to about 25,000 bags in 1937, the utilization of the wax products of this tree has been delayed because of difficulty in extracting it. (The methods applied in Carnauba wax extraction gave no results). This difficulty has been overcome, however, and the Licuri wax came into production in Bahia in 1937 to the extent of 747 kg. and increased to more than 1,000 tons in 1940 with a second large increase in the value of the production in 1941.

The remainder of the bulletin takes up the chemistry of waxes, animal and vegetable; the waxes of palms; extraction processes for vegetable waxes; Carnauba wax, and the Licuri wax (an extensive section including a botanical description of the tree, its various products, the production of the oil and wax, etc.); names of the Licuri tree; the cigaret beetle (*Lasioderma serricorne*) in Licuri wax; the palm wax industry and the health of the operators; and formulas for the utilization of the Licuri wax and oil in local industry.

Ester wax: A new embedding medium, H. F. STEEDMAN (*Nature [London], 156 (1945), No. 3952, pp. 121-122*).—Seeking an embedding medium free from the "many disadvantages" of paraffin, the author found no single substance, among the natural and synthetic fatty acid esters examined, which met all requirements. A mixture consisting mainly of diethylene glycol distearate proved suitable for most tissues, however. The formula given is as follows: Diethylene glycol distearate, 82 gm.; ethyl cellulose (low viscosity), 4 gm.; "stearin," 5 gm. [meaning of "stearin" not specifically indicated]; and ricinoleic (octadecanediol) diacetate, 9 gm.; the first-named component being heated, filtered, and held in the molten condition for 2 days to permit settling out of any free diethylene glycol, from which the ester is to be decanted. Ricinoleic diacetate was prepared from the alcohol and acetic anhydride, but "castor oil may be used instead."

To make up the mixture put the diacetate into a porcelain pot and add about 15 gm. of the distearate. Heat until the distearate is melted and then add the ethyl cellulose. Heat until this is dissolved and then add the rest of the distearate and the stearin. The cellulose dissolves only at a high temperature (approximately 100° C.) and solution should take place with the minimum possible of the two other solids present.

This embedding mixture was found to melt at 48° and had a section range of from 4 μ to 20 μ at 66° F. and a ribboning range of from 4 μ to 15 μ at the same temperature. Compression remaining after expansion of the ribbons on warm water was 7.6 percent when the section thickness was 10. As with paraffins hardened by adding a stearic acid (E. S. R., 81, p. 184), the cutting had to be done at a speed less than that suitable for pure paraffins to avoid wrinkling, but cutting too slowly resulted in poor ribboning.

"The most important property of ester wax is that of 'ribbon staining.' Instead of flattening on water, as with paraffin wax, ester wax sections may be flattened on stain solutions which easily penetrate the wax and stain the sections. The stain is then drained off, the slide irrigated with water to remove the excess stain, and the sections may then be dried in an oven."

The inhibition of carbohydrate oxidations by borate, W. E. MILTZER. (Univ. Nebr.). (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 247-253, illus. 2).—In alkaline solutions at ordinary temperatures the oxidations of 5-keto-D-gluconic acid, dehydro-L-ascorbic acid, and 2,3-diketo-L-gulonic acid were inhibited by borate ion strongly enough to stop the reactions completely. The inhibition was found a general one, apparently involving a combination between the borate and the sugar. Structures found not to be inhibited by borate under the same conditions were the enediol, as in ascorbic acid, and sulfhydryl groups.

The acid hydrolysis of lactose and the preparation of hydrolyzed lactose sirup, G. A. RAMSDELL and B. H. WEBB. (U. S. D. A.). (*Jour. Dairy Sci.*, 28 (1945), No. 9, pp. 677-686, illus. 6).—In a study of the factors affecting the hydrolysis of pure solutions of lactose by heat, the velocity constant ($K \times 10^4$) for the reaction varied with the time and temperature of hydrolysis and the acid and lactose concentration of the solutions. Values for $K \times 10^4$ ranged from 11 at 100° C. to 1,904 at 165°. Hydrochloric acid, used in concentrations of 0.001 to 1.0 mole per 1,000 gm. of solution, was found to be a catalyst more effective than citric acid.

There was a progressive destruction of lactose and of the newly formed hexoses during hydrolysis. This destruction was accelerated by conditions of excessive or prolonged heating and when high sugar and acid concentrations were used. Hexose sugars were obtained to the extent of 93 percent of the theoretical yield by hydrolyzing a 30-percent lactose solution, using 0.007 mole of HCl per 1,000 gm. of mixture and heating to 147°. The process, conducted in a glass-lined pressure kettle, required a total time of 65 min., of which 60 min. were used to heat the batch to 147°. A solubility curve for galactose in aqueous glucose solutions at 25° was determined. The solubility of glucose at 25° is 50.8 percent, galactose 32.09 percent, and a mixture of equal parts of both hexoses 42 percent. The maximum concentration of the two hexoses which is soluble at 25° is 58.3 percent, consisting of 49.8 percent glucose and 8.5 percent galactose. The authors are of the opinion that the lactose in skim milk, whey, or crude lactose cannot be hydrolyzed without the use of excessive quantities of acid and the production of undesirable protein decomposition products.

The titrimetric determination of "Lactobacillus casei factor" and "folic acid," L. J. TEPLY and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 303-309, illus. 3).—A modification of the *Streptococcus lactis* R medium of Luckey et al. (E. S. R., 92, p. 760) permitted more acid production, making it more suitable for titrimetric assays for folic acid. The use of previously described media for *L. casei* assay of *L. casei* factor gave unsatisfactory results. The difficulties were eliminated by providing additional supplements in the basal medium.

The oxidation of p-aminobenzoic acid and anthranilic acid by specifically adapted enzymes of a soil bacillus, G. S. MİRICK (*Jour. Expt. Med.*, 78 (1943), No. 4, pp. 255-272, illus. 3; also in *Rockefeller Inst. Med. Res. Studies*, 125 (1944), pp. 209-226, illus. 3).—The author describes a method for the isolation of a soil bacillus which produces, when grown in the presence of p-aminobenzoic acid, specific adaptive enzymes which easily oxidize the amino acid. The same organism can produce enzymes which oxidize ortho isomer and anthranilic acid.

Polarographic studies of proteins and their degradation products.—I, The "protein index," O. H. MÜLLER and J. S. DAVIS, JR. (Cornell Univ.). (*Jour. Biol. Chem.*, 159 (1945), No. 3, pp. 667-679, illus. 4).—A quantity designated as the protein index is proposed by the authors as a convenient means of characterizing and comparing polarographic results obtained with blood proteins and their degradation products during reduction in a buffered cobalt solution. It represents the ratio of the two wave heights obtained in the filtrate and the digest tests,

multiplied by a suitable factor. The protein index is practically independent of small variations in room temperature and of considerable changes in the drop time and drop size of the dropping mercury electrode, and thus is especially well suited for routine analysis of blood proteins. The height of the protein double wave is little influenced by alteration in the drop time of a given electrode, and it is approximately proportional to the surface area of the mercury drops or to the two-thirds power of the radius of the capillary orifice.

An electrophoresis apparatus for the rapid routine analysis of sera and other protein solutions, A. POLSON (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 20 (1945), No. 2, pp. 159-163, illus. 2).—Improvements in the method included reduction in the working temperature by immersion of the apparatus in a water bath holding the temperature to 2° C. to permit use of higher voltages and reduced time of electrophoresis; addition to the set-up of a device for removing the electrophoresis cell from the cooling bath without disturbance of the liquid in the cell; addition of a mechanical movement permitting controlled motion of a very fine pipette and its use for withdrawing liquid very slowly at the imperfect protein buffer interface to form a very sharp interface; means for registering the migrating components; and a procedure for the identification of components in the electrophoresis diagrams.

The biuret reaction of proteins in the presence of ethylene glycol, J. W. MEHL (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 173-180, illus. 2).—The biuret reaction was so modified, by the introduction of ethylene glycol which prevents the precipitation of cupric hydroxide, that a single reagent gave optically clear solutions when mixed with protein. Deviations from Beer's law, which may be as large as 10 percent for a fourfold change in protein concentration, were observed under these conditions, but could readily be corrected for and did not seriously impair the usefulness of the method. The sensitivity of the biuret method could be further increased by making use of the greater absorption of the protein-copper complex in the region around 320 mμ.

Determination of amino acids by the solubility product method, S. MOORE and W. H. STEIN (*Jour. Biol. Chem.*, 150 (1943), No. 1, pp. 113-130, illus. 3; also in *Rockefeller Inst. Med. Res. Studies*, 125 (1944), pp. 1-18, illus. 3).—The authors describe the work here reported upon as largely developmental. In principle, taking the determination of an amino acid with the help of an aromatic sulfonic acid as an example, two aliquots of an amino acid solution containing the same molar concentrations of the amino acid to be determined are taken, a sparingly soluble sulfonic acid salt of the amino acid is added to one aliquot, and the molar solubility of this salt is determined after establishment of an equilibrium at 0° [C.]. To the second aliquot, a known molar concentration of the free sulfonic acid or of its sodium salt is added and the solubility of the amino acid sulfonate is again determined, as above, in the resulting solution. Solubility products are computed from the data thus obtained and are combined in an equation giving the molar concentration of the amino acid to be determined. Two experimental results are provided for: (1) The soluble production is constant under the stated conditions and the two K values are set equal in the equations for a direct solution for the concentration of the amino acid to be determined; or (2) the values are not identical and a factor F is introduced "to account for small deviations if they are reproducible."

The gasometric determination of free amino acids in blood filtrates by the ninhydrin-carbon dioxide method, P. B. HAMILTON and D. D. VAN SLYKE (*Jour. Biol. Chem.*, 150 (1943), No. 1, pp. 231-250, illus. 2; also in *Rockefeller Inst. Med. Res. Studies*, 125 (1944), pp. 333-351, illus. 2).—The method of Van Slyke, Dillon, MacFadyen and Hamilton (*E. S. R.*, 88, p. 588) for determination of free α-amino

acids, by measurement of the CO_2 evolved from their carboxyl groups by reaction with ninhydrin, was applied to protein-free filtrates of blood, erythrocytes, and plasma. Picric and tungstic acids were shown to yield filtrates without loss of amino acids, but deproteinization with zinc, cadmium, or ferric hydroxide resulted in losses. Refinements were added to the micro manometric technic, so that the 40% or 50% of amino acid nitrogen in the filtrate from 1 cc. of plasma can be measured within ± 1 percent. A manometric modification of the nitrous acid method (E. S. R., 26, p. 22) "for determination of primary aliphatic amines showed in plasma mean total amino nitrogen 1.08 times the amounts determined by the more specific ninhydrin- CO_2 method. In blood cells the nitrous acid method showed an average of 1.42 times as much as the ninhydrin, indicating the erythrocytes contain considerable amounts of amino nitrogen in forms other than the α -nitrogen of free amino acids."

The gasometric determination of amino acids in urine by the ninhydrin-carbon dioxide method, D. D. VAN SLYKE, and D. A. MACFADYEN, and P. B. HAMILTON (*Jour. Biol. Chem.*, 150 (1943), No. 1, pp. 251-258; also in *Rockefeller Inst. Med. Res. Studies*, 125 (1944), pp. 353-360).—The gasometric determination of free amino acids by the specific reaction with ninhydrin (E. S. R., 75, p. 158) to evolve CO_2 was applied to urine. The method was found to give values somewhat smaller than those yielded by nitrous acid or by formaldehyde titration, both of the last named procedures showing the effect of a means other than amino acids.

Microbiological methods for the determination of amino acids, I-II (*Jour. Biol. Chem.*, 157 (1945), No. 2, pp. 651-659, illus. 2; 160 (1945), No. 1, pp. 35-49, illus. 1).—Of the 12 amino acids dealt with in the first two papers of this series, 9 are determined as factors limiting the growth of *Streptococcus faecalis*, the other 3 similarly by the use of a strain of *Lactobacillus delbrückii*.

I. *Aspartic acid and serine*, J. L. Stokes and M. Gunness (pp. 651-659).—The authors describe a method based upon the quantitative response of *L. delbrückii*, of the strain LD5 (American Type Culture Collection, Georgetown University School of Medicine, No. 9595), to aspartic acid and to serine. They found the procedure here set forth to be specific and accurate for the determination in purified proteins of the two amino acids named.

II. *A uniform assay for the ten essential amino acids*, J. L. Stokes, M. Gunness, I. M. Dwyer, and M. C. Caswell (pp. 35-49).—The authors find the procedures here described to be specific, sensitive, and accurate for the determination of histidine, arginine, lysine, leucine, isoleucine, valine, methionine, threonine, tryptophan, and phenylalanine, in foodstuffs and other natural products as well as in purified proteins and synthetic amino acid mixtures. They found that a complete amino acid analysis can be made with 1.5 gm. or less of sample. With only one medium and procedure, nine of the amino acids are determined with *S. faecalis* and phenylalanine with *L. delbrückii* LD5. The response of the two organisms to the amino acids is measured by titrating, with standard alkali, the lactic acid formed during growth. The method yields many replicate results within a short time and lends itself readily to routine use. The quantities of essential amino acids in casein, gelatin, egg albumin, β -lactoglobulin, silk fibroin, tobacco mosaic virus, rye, wheat, patent flour, soybean flour, whole milk, peas, carrots, potatoes, beef liver, brewers' yeast, blood meal, tankage, alfalfa meal, and linseed meal are presented.

The microbiological determination of amino acids.—II, Glutamic acid, C. M. LYMAN, K. A. KUIKEN, L. BLOTTER, and F. HALE (Tex. Expt. Sta.). (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 395-405, illus. 2).—In this second year paper (E. S. R., 90, p. 296), a microbiological method for the determination of *l*(+)-glutamic acid with *Lactobacillus arabinosus* 17-5 as the test organism is described.

The method is considered applicable to the determination of glutamic acid in peptides, proteins, and foodstuffs. Its validity was tested by the analysis of pure proteins of known glutamic acid content. The data were found to suggest that glutamine must be formed from glutamic acid by the organism if it is not present in the medium, and that the organism cannot readily carry out this conversion when the glutamic acid concentration is low.

Tests on the specificity of the organism for glutamic acid showed that glutamine is very active, that α -ketoglutaric acid is active under certain conditions, and that β -hydroxyglutamic acid and pyrrolidonecarboxylic acid are completely inactive. The ratio of the activity of *dl*- and *l*(+)-glutamic acid was found to vary, depending on the test level.

A *Lactobacillus* assay method for *l*(+)-glutamic acid, J. C. LEWIS and H. S. OLCOTT. (U. S. D. A.). (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 265-285, illus. 3).—A *Lactobacillus arabinosus* strain designated 17-5 was used, and amino acid requirements other than *l*(+)-glutamic acid were supplied by a glutamic acid-free casein hydrolysate prepared by repeated cycles of autoclaving at pH 3 to convert glutamic acid to pyrrolidonecarboxylic acid and selective extraction of the latter with ethyl acetate. The effects of a number of factors involved in the assay were studied in detail. This biological assay method was found capable of a precision of 1 to 2 percent. Assays of acid hydrolysates of proteins, polypeptides, yeast, and Steffen's waste were made. For most hydrolysates, the accuracy of the assays as judged by recovery experiments approached the precision. Of some 20 materials assayed, only hydrolysates of crystalline egg albumin and crystalline pepsin contained interfering substances which gave recovery values in error by as much as 5 to 10 percent.

The *l*(+)-glutamic acid contents of the following proteins are reported for the first time: Silk fibroin 2.1 percent; lysozyme 3.5; purothionine 2.7; growth hormone 14.5; and lactogenic hormone 13.4 percent.

Two microbiological methods for the determination of *l*(+)-tryptophane in proteins and other complex substances, J. G. WOOLEY and W. H. SEBRELL (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 141-151, illus. 2).—Two methods of assaying *l*(-)-tryptophan, one by utilizing *Lactobacillus arabinosus* 17-5, the other *Eberithella typhosa* T-63, gave identical results. In sodium hydroxide hydrolysates of proteins and in protein-containing foodstuffs irregular *l*(-)-tryptophan values were obtained. The digestion of proteins and other materials by enzymes and the superiority of this form of hydrolysis for microbiological assays are discussed. Close agreement between percentages of tryptophan determined in materials digested by enzymes was obtained in assays both by the chemical method of Horn and Jones (noted below) and by the microbiological methods.

A rapid colorimetric method for the determination of tryptophane in proteins and foods, M. J. HORN and D. B. JONES. (U. S. D. A.). (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 153-160).—Difficulties due to nonprotein constituents of food materials were avoided by substituting hydrolysis with a papain solution for acid hydrolysis, filtering off the undissolved residue with the help of a filter aid, and adding the *p*-dimethylaminobenzaldehyde reagent used by May and Rose (*E. S. R.*, 48, p. 312) together with a suitable oxidizing agent to develop the color. Hydrogen peroxide could not be used because of a fading of the color. Both sodium nitrite and sodium nitroprusside solutions (aged for a week before using) gave a color permanent for an hour.

Microdetermination of glycocyamine and arginine by means of a synthetic ion exchange resin for chromatographic separation, E. A. H. SIMS (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 239-245, illus. 1).—The authors point out that their micromethod for the determination of glycocyamine and arginine in biological fluids,

here described, differs from previous methods in that it is accurately reproducible because it employs ion exchange resins with uniform properties.

A device to regulate downflow in small columns, which makes feasible chromatographic procedures involving the use of adsorbants of coarse texture, is described.

Quantitative microdetermination of ammonia in the presence of glutamine and other labile substances, R. M. ARCHIBALD (*Jour. Biol. Chem.*, 151 (1943), No. 1, pp. 141-148, illus. 2; also in *Rockefeller Inst. Med. Res. Studies*, 125 (1944), pp. 325-332, illus. 2).—The author's method "in principle is identical with that described by Pucher et al. [*E. S. R.*, 75, p. 158], but has been modified to apply to blood and to smaller portions of ammonia and to facilitate rapid transfer of distillate and washings to the volumetric container in which it is nesslerized." An apparatus, of which the dimensions are specified in detail in a drawing, is described, together with the reagents and manipulative detail. Distillation under reduced pressure is provided for, the maximum temperature being 42.5° [C.], and the alkalinity just sufficient to set free the ammonia without decomposing such labile compounds as glutamine is produced by a specified borate buffer mixture and other reagents. An antifoam mixture prevents foaming over of the sample solution.

Determination of glucose, galactose, and lactose in their mixtures, G. A. RAMSDELL. (U. S. D. A.). (*Jour. Dairy Sci.*, 28 (1945), No. 9, pp. 671-676, illus. 3).—A method for determining the glucose, galactose, and lactose in hydrolyzed lactose sirups consists in determination of the sum of the two hexoses by means of a modified Barfoed solution, and the glucose and lactose according to Shaffer and Somogyi before and after fermentation with washed bakers' yeast. Four samples of hydrolyzed lactose sirups were analyzed by this procedure and the results and steps in the calculations are described. Sirup No. 1, which attained a maximum temperature of only 143° C. at the expiration of 35 min., still contained 8.6 percent lactose; whereas sirup No. 3, which was heated for 65 min.—and 15 min. of this time the temperature was 143°-147°—showed no lactose. There was, however, a loss of 2.37 percent in sugar content, which was converted into by-products. The reducing values of these byproducts were of negligible amount. It is indicated that the maximum error for the complete analysis should not exceed 7 percent.

The colorimetric determination of fructosan in plant material, W. L. MCRARY and M. C. SLATTERY. (U. S. D. A.). (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 161-167, illus. 2).—A procedure for the colorimetric determination of fructosan in plant material is based on the formation of a colored compound from resorcinol and fructosan. Under modified conditions described by the authors, the method may be expected to yield values reproducible to within ± 5 percent. Sources of error peculiar to plant tissues are discussed, and procedures for determining their magnitude are given.

A rapid method for the determination of chlorophyll in apple leaves, O. C. COMPTON and D. BOYNTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 45-50, illus. 2).—The proposed method is said to provide a rapid and accurate means for determining chlorophyll in plant tissues. Transmission of light above 610 m μ is measured in a photometric colorimeter by use of a suitable filter, comparison being made against readings obtained with pure chlorophyll. Certain precautions as to filtering, sampling, decomposition by light, and the effect of the solvent on extraction are pointed out. The seasonal trend in chlorophyll for one orchard is discussed in relation to fertilizer practices and yields.

Chemical determination of pyridoxine: Reactions in pure systems, M. HOCHBERG, D. MELNICK, and B. L. OSER (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 109-117, illus. 2).—The method, described in detail, is based upon the coupling

reaction of pyridoxine with 2,6-dichloroquinonechloroimide in a strongly buffered (ammonia-ammonium chloride) alcoholic solution (isopropanol) yielding a blue pigment which is estimated photometrically. The reaction is read 60 sec. after the chloroimide reagent is added. Potential errors due to other compounds coupling with the reagent are eliminated by running a duplicate tube containing an excess of borate, which under proper conditions, suppresses the reaction of pyridoxine without affecting the reaction of the other coupling compounds (aniline, phenol, β -naphthol, catechol, resorcinol, and various pyridine compounds). The photometric density of the dyes formed by pyridoxine and the interfering compound are additive. In the presence of relatively high concentrations of these compounds (resorcinol, naphthylamine hydrochloride) the photometric density due to a given amount of pyridoxine may be greatly inhibited within the period of the measurement, but as the photometric density per unit of pyridoxine (K value) in a given solution is constant, the addition of the pyridoxine standard in the form of an increment to an aliquot of the test solution containing the inhibitory substance automatically corrects for the interference noted. (Only the diacetyl derivative of pyridoxine shows an appreciable difference in reaction in the presence or absence of boric acid).

Determination of riboflavin in chocolate milk and the comparative photochemical losses in riboflavin in chocolate and whole milk, M. R. and C. L. SHETLAR and J. F. LYMAN. (Ohio State Univ.). (*Jour. Dairy Sci.*, 28 (1945), No. 11, pp. 873-878, illus. 3).—A rapid fluorometric method for determining riboflavin which is applicable to chocolate as well as whole milk is described. The method produces results which compare closely with those from other fluorometric methods and with the microbiological method. Chocolate milks lose riboflavin very slowly when exposed to sunlight, the average loss of riboflavin after 4 hr. for five different brands being about 12 percent as compared to a loss of 80 percent for whole milk.

The use of *Lactobacillus fermentum* 36 for thiamine assay, H. P. SARETT and V. H. CHELDELIN. (Oreg. State Col.). (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 153-160, illus. 1).—The method, described in detail, is based upon the turbidimetric measurement of the growth of *L. fermentum* 36, after incubation for 16 to 18 hr. at 37° [C.] in a suitable basal medium.

The organism shows a steep quantitative response to thiamine concentrations of 0.005 γ -0.04 γ . Carboxylase is 30 percent more active than equimolecular amounts of thiamine, so that samples are digested enzymatically to insure conversion to free thiamine. Pyrimidine and thiazole generally show no effect upon the 16-18 hr. turbidity reading. However, some influence is noted after 20-24 hr., and in 40-48 hr. these moieties are almost as active as thiamine. This prevents the use of an assay by acid titration.

Results obtained by the *L. fermentum* method are in good accord with those obtained by the best recommended yeast growth, fermentation, or thiochrome methods. Fresh or dehydrated foods, tissues, urines, and vitamin concentrations can be assayed by this method, and samples show good agreement at different levels, and good recovery of added thiamine (± 10 percent) is obtained.

Studies on the sex hormones.—I, The quantitative estimation of estrone in pure solution, F. P. VETCH, JR., and H. S. MILONE (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 61-65, illus. 3).—The authors prepared and characterized the 2,4-dinitrophenylhydrazones of estrone, determining the concentration-transmittance relationship of this hydrazone on 0.1 N alcoholic potassium hydroxide at 440 m μ . They describe and outline a chromatographic method for the quantitative separation of small amounts of the 2,4-dinitrophenylhydrazone of estrone from unchanged hydra-

zine and a sensitive method for the quantitative estimation of small amounts of estrone in pure solution.

Volumetric determination of moisture in dairy products, B. HEINEMANN (*Jour. Dairy Sci.*, 28 (1945), No. 11, pp. 845-851).—The Karl Fischer reagent,* consisting of a solution of iodine, pyridine, and sulfur dioxide in absolute methanol, was successfully employed in the analysis of moisture in certain dairy products containing less than 20 percent moisture, including butter, butter oil, dry milk solids, and sweetened condensed milk. Direct titration with this reagent was found to be satisfactory when a glass-platinum electrode assembly was used with a Beckman pH meter.

The determination of uric acid in poultry excreta with uricase, S. BOSE and D. B. GHOSH (*Poultry Sci.*, 24 (1945), No. 2, pp. 146-149).—An enzymatic method for the determination of uric acid in poultry excreta was based on the catalytic oxidation of uric acid by uricase. The applicability of the method was tested by quantitatively recovering different amounts of uric acid added to poultry excreta, cow feces, and true poultry feces. The results obtained by the uricase method compared very favorably with those obtained by the iodimetric method.

Análisis de insecticidas [Analysis of insecticides], P. HERCE (*Madrid: Inst. Nac. Invest. Agron.*, 1945, pp. 163+, illus. 21).—Technics are presented for analyses of insecticides acting by ingestion, contact, and asphyxiation.

AGRICULTURAL METEOROLOGY

Handbook of meteorology, edited by F. A. BERRY, JR., E. BOLLAY, and N. R. BEERS (*New York and London: McGraw-Hill Book Co.*, 1945, pp. 1068+, copiously illus.).—This handbook "is designed to furnish the student and the professional meteorologist a convenient text reference for data, fundamental theory, and weather analysis and forecasting," the emphasis being placed on the scientific and engineering aspects, rather than on current technics.

Meteorology—theoretical and applied, E. W. HEWSON and R. W. LONGLEY (*New York: John Wiley & Sons; London: Chapman & Hall*, 1944, pp. 468+, illus. 194).—The two main considerations prompting the authors to write this textbook were that they believed the need for an introductory treatment of basic meteorological theory to be particularly great and a closer integration of forecasting technic with the theory on which it is founded to be desirable. "The present work endeavors to meet both these needs."

The air-mass calendar: A basic tool for studies in air-mass climatology, U. J. LINEHAN (*Amer. Met. Soc. Bul.*, 26 (1945), No. 7, pp. 274-277).—"The primary intent of this paper is not to analyze the possibilities and limitations nor to attempt to justify the cultivation of air-mass climatology but rather to call attention to the problem of providing data suitable for constructing the air-mass calendar, a necessary adjunct in undertaking almost any investigation in air-mass climatology." Attention is called to the advantages from use of the Bergeron system of classification (or some modification) as a basis for making air-mass and frontal sequence determinations suitable for constructing air-mass calendars, and to the desirability of having the U. S. Weather Bureau take whatever steps may be necessary to insure that the recently inaugurated policy of recording air masses be careful, consistent, and complete enough to serve as a source of such data. It is hoped that the resulting greater availability of data suitable for constructing air-mass calendars will encourage further investigations in air-mass climatology.

* Agnew. Chem., 48 (1935), No. 26, pp. 394-396.

Observations of the clouds and weather during a flight over and into the Gulf hurricane of September 18, 1943 (*Amer. Met. Soc. Bul.*, 26 (1945), No. 7, pp. 271-273).—Observations in a Gulf of Mexico hurricane made on a B-17 plane in a round-trip flight from Oklahoma City.

Relative humidity gradient and the form of cloud bases, C. E. DEPPERMAN (*Amer. Met. Soc. Bul.*, 26 (1945), No. 7, pp. 267-270, illus. 3).—The author concludes from this study that no matter what the temperature gradient, the condition for flat cloud bases at a definite pressure level is a certain definite relative humidity gradient with respect to barometric pressure; if the relative humidity gradient is less steep than the critical one for flat cloud bases, then there will be a tendency for cloud bases curved convex downward; if the relative humidity gradient is more steep than the critical one for flat bases, then there will be a tendency for cloud bases curved concave downward.

Notes on upper air hygrometry.—I, Calculation of the relative humidity from hair hygrometer readings during balloon ascents, E. GLÜCKAUF (*Roy. Met. Soc. [London], Quart. Jour.*, 70 (1944), No. 306, pp. 293-301, illus. 3).—"A method is described for calculating the relative humidity from the data obtainable from balloon hair hygrograph records under conditions in which the hair does not reach equilibrium with its surroundings. Based on and checked by means of laboratory measurements, the method gives consistent results if applied to the Dines meteorograph."

The variation of vorticity in the atmosphere, E. V. ASHBURN and L. L. WEISS (*Amer. Geophys. Union Trans.*, 26 (1945), No. 2, pp. 205-211, illus. 9).—"The principle of conservation of vorticity with reference to an inertial frame is reviewed and its consequences on a rotating spherical earth considered. It is shown that if the absolute vorticity of an atmospheric element were conserved, then the vertical component of the vorticity would vary if the absolute longitude and latitude were changed. Actually, in the atmosphere there are many factors that change the absolute vorticity of the fluid elements. The buoyant force (flotation-force), the baroclinic nature of the atmosphere, divergence-viscosity, turbulence, and nonadiabatic processes are some of the more important of these factors. Some of the ways in which the buoyant effect tends to change the vorticity are discussed here in qualitative terms. A method of attack is suggested for a more complete treatment of the motions of the earth's air cover. Equations showing the relationship between the divergence and the time rate of change of the vorticity are also given."

The evaluation of the coefficient of eddy diffusivity, R. W. LONGLEY (*Roy. Met. Soc. [London], Quart. Jour.*, 70 (1944), No. 306, pp. 286-292).—"Observational data have been substituted into a modified form of the equation of heat transfer. By a statistical analysis of the resultant equations, values of the coefficient of eddy diffusivity for various stable lapse rates are obtained. It was found necessary in the analysis to define a 'point of best fit,' and to derive the normal equations for obtaining this point."

The significance of rapid rises in temperatures on Mount Washington in severe cold waves, C. F. BROOKS (*Amer. Met. Soc. Bul.*, 26 (1945), No. 7, pp. 292-293).—A brief note with discussion by V. F. Clark.

The altitude of the zenithal sun: A geographic approach to determination and climatic significance, R. P. BECKINSALE (*Geog. Rev.*, 35 (1945), No. 4, pp. 596-600, illus. 3).—The altitude of the sun is so vital a factor that the author set out to find a formula simple but accurate enough for ready use without recourse to declination tables; an approximate formula is presented and the climatic significance of this factor is discussed.

A note on multiple rain-gages, H. G. FOURCADE (*Amer. Geophys. Union Trans.*, 26 (1945), No. 2, pp. 267-268, illus. 1).

Aleppo pine as a medium for tree-ring analysis, J. GINDEL (*Tree-Ring Bul.*, 11 (1944), No. 1, pp. 6-8, illus. 5).—Although this pine (*Pinus halepensis*) shows early and great sensitivity to climatic elements, particularly to rains and temperature, discrepancies appear between the relative ring width and the amount of annual (winter) rainfall; these are due to unfavorable distribution of rains, too high or too low temperature, and the intensity of khamsin winds during the seasonal growth. The dynamics of these climatic factors form also conditions favorable to the formation of false rings which are sometimes inner but more frequently outer rings. The formation of the outer, usually ill-defined, false rings on Mt. Carmel, Palestine, occurs under climatic conditions similar to those in which false rings are formed at Carmel, Calif. The similarity of tree growth at the two sites, 6,350 miles from each other, is very suggestive.

Tree-rings and runoff in the South Platte River Basin, E. SCHULMAN (*Tree-Ring Bul.*, 11 (1945), No. 3, pp. 18-24, illus. 1).—The usefulness of centuries-long tree-ring histories of river runoff in such phases of water supply as hydroelectric power, irrigation, and conservation has led in recent years to intensive work along these lines at the Tree-Ring Laboratory, Tucson, Ariz. Although specific attention is here directed to a preliminary index to one basin, it is believed that the present notes concern problems applicable to all basins in the western United States. Included is a tabulation of some measured tree groups in the Rocky Mountains useful for runoff indexes.

Tree-ring work in Scandinavia, E. SCHULMAN (*Tree-Ring Bul.*, 11 (1944), No. 1, pp. 2-6, illus. 1).—Tree-ring chronologies in Scandinavia are said to exceed in volume those for any other region outside the southwestern United States. The notes presented aim to provide a wider accessibility to some of the more recent material.

Zonagem fitoclimática: Como se tem feito em Portugal [Phytoclimatic zones of Portugal], J. DE P. M. E ALBUQUERQUE (*Agron. Lusitana*, 5 (1943), No. 3, pp. 191-225, illus. 7).—"Zonage" is defined as a term denoting the complex of studies leading to the delimitation of the agricultural zones of a country in relation to its ecological, demographic, and economic conditions. The author reviews the studies carried out along these lines by various authors (54 references) in Portugal and illustrates them by seven maps.

Bioclima de los citrus en el litoral Argentino [Climatic relations of citrus in Argentina], G. HOXMARK (*An. Soc. Cient. Argentina*, 140 (1945), No. 1, pp. 3-15, illus. 1).

Weather conditions favorable for potato late blight, K. H. FERNOW (*N. Y. State Col. Agr., Cornell Ext. Bul.* 678 (1945), pp. [4], illus. 1).—An informative leaflet.

Some aspects of weather and oil spraying for prune bud stimulation, J. JANOF-SKY (*Amer. Met. Soc. Bul.*, 26 (1945), No. 7, pp. 284-287).—Information at hand indicates that if timed rightly oil spraying will advance the blooming period by 7 to 10 days. If done too early it may have no appreciable effect; if too late, it will retard development and may kill wood. As a rule the best results have followed spraying after a month of cold weather, just as the buds are ready to swell but not later than 2 to 3 weeks before warm weather begins. The relationships of weather, soil type, location, and individual orchard care are discussed, and some bloom dates and county prune yields in California are tabulated.

Some remarks upon the destructive effects of the hurricane, September 14-15, 1944, observed at Hyannis, Cape Cod, Massachusetts, V. CONRAD (*Amer. Geophys. Union Trans.*, 26 (1945), No. 2, pp. 217-219).—Notes on the effects on buildings and trees, including the distribution of destruction.

SOILS—FERTILIZERS

Equipment for facilitating mechanical analysis of soils, E. P. PERRY. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 372-373, illus. 2).—A rack and equipment for washing soil samples after their treatment with hydrogen peroxide and hydrochloric acid is described, together with a stirrer found to be efficient for dispersing samples for pipette analysis. Details of construction of both pieces of apparatus are discussed and illustrated in drawings.

The Imperial Valley soil sampling apparatus, W. W. DONNAN, V. S. ARONOVIC, and W. W. FOX. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 367-371, illus. 5).—The authors point out that a single tube 18 ft. long (the present maximum depth of Imperial Valley soil investigations) is impractical as regards both the starting of the tube into the ground and extracting the outer tube after drilling is completed, and that two 9-ft. or three 6-ft. tubes joined by threading involve too many time-consuming operations and are structurally inferior. A set of telescoping tubes is therefore used in the following manner: A 6½-ft. tube assembly 2½ in. in diameter, complete with inner tube, coring cylinder, and split sleeve, is put down in 18-in. stages and samples are taken. When the 6-ft. depth is reached the inner tube and its attachments are removed and replaced by a complete assembly 13 ft. long and 1¾ in. in diameter, consisting of outer tube, inner tube, coring cylinder, and split sleeve. Boring continues in 18-in. increments to 12 ft., where the inner tube and attachments are removed and a 19½-ft. assembly, 1½ in. in diameter, is lowered into the outer 13-ft. tube. Boring then continues to the 18-ft. level. In withdrawing the tubes, no tube is pulled through more than a 6-ft. zone of contact with the soil. When the 19½-ft. tube is pulled 6 ft. it can be removed by hand, since it is then free inside the 13-ft. tube. Likewise, after the 13-ft. tube is pulled 6 ft. it can be lifted out of the 6½-ft. tube. This design eliminates excessive side friction which is a major factor affecting ease of driving and of pulling. Construction detail is fully discussed and is illustrated in drawings.

Objectives and criteria of soil classification, H. H. KRUSEKOPF. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 374-376).—The author of this general discussion of progress and current practice in soil surveying holds that it is desirable from time to time to reexamine the general principles and practices which we are following in soil classification and to compare them with such new tendencies as have been adopted and are modifying our attitude in soil taxonomy. "This paper is not concerned with the broader aspects of soil classification that relate to regional grouping, but is confined to local or unit classification as performed in ordinary field soil surveying. It is intended primarily as a brief review of present trends and attitudes that are of vital interest to every pedologist."

Classifying soils for mapping in the Rocky Mountain region, J. THORP. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 377-378).—The author finds that the soils of the Rocky Mountain region offer problems as interesting in the field of soil taxonomy as they are vexatious in the field of practical classification for surveying. He holds that the field party and the survey inspector should study the problem from both viewpoints and develop a legend for mapping that will provide for the recognition of soil units significant for land use and at the same time cover all taxonomic units of the area to be surveyed. The effects of each of the five commonly recognized factors of soil formation must be given both separate and collective consideration. Factors which the author points out as complicating the classification of the Rocky Mountain region soils include the wide variations in climatic conditions resulting from great differences in elevation, the differences in vegetation which arise from the climatic variations, and the great variety in parent materials which, in the zone of transition from mountains to plains, "covers the

whole gamut of sedimentary rocks and soil materials, since the rocks include limestones, sandstones, shales, sands, and clays of all varying degrees of hardness, color, and mineralogical compositions. Loess, aeolian sands, and wind-drifted clays on the borders of the plains and in the intermountain valleys add to the complication of parent materials." Differences in relief, though they cause fewer classification difficulties than do the other factors noted, also add somewhat to the complexity of the problem.

California soil color standards and their relation to the ISCC-NBS method of designating colors. R. A. GARDNER. (Univ. Calif.) (*Soil. Sci. Soc. Amer. Proc.*, 8 (1943), pp. 355-357, illus. 2).—Color standards for California soils were established primarily for the purpose of assisting in the classification and identification of the soils of the State. The standards are essentially those proposed by Shaw (E. S. R., 67, p. 212), obtained by averaging the factorial specification of a large number of surface soil samples of each color designation as expressed by field men who collected the samples. In addition to Shaw's standards, the factorial specifications for standard dark brownish gray, dark brown, and light reddish brown soil colors are included. The procedure used in making color comparison cards using selected soil samples for standard colors is given. The soil samples selected conform to the factorial specifications of the standards as calculated. A table and graphs showing the relationship of California soil color designations and corresponding Inter-Society Color Council-National Bureau of Standards color designation (E. S. R., 86, p. 741) are presented.

A brief discussion of the two main types of bases for soil color designation, the soil "color world" and the entire color world, is included.

Some considerations in the magnesium cycle of weathering in Solonetz soils. F. F. RIECKEN (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 391-395, illus. 3).—The exchangeable Mg present in the native state on the B horizon samples of the Solonetz soils was fully as exchangeable as the Mg on the non-Solonetz soils. The exchangeable Mg was released in normal manner for all symmetry values studied. In the soils studied, the exchangeable Mg was more easily replaced than the exchangeable Ca. Below pH values of about 7.5, the Ca ions were more energetically absorbed than the Mg ions. The significance of these results in relation to those of a number of other investigators is discussed in some detail.

Effect of weathering on Houston black clay. R. WOODBURN (*Miss. Farm. Res. [Mississippi Sta.]*, 8 (1945), No. 10, p. 7, illus. 2).—Graphs are presented showing the effect on aggregation of oven drying and wetting on Houston clay subsoil and of continued drying on Memphis silt loam. Soil slaking is considered in relation to the nature of the mineral from which the clay particles are derived.

Mechanical separates and their fractions in the soil profile.—II, The cation exchange properties and pedogenic implications. J. S. JOFFE and R. KUNIN. (N. J. Expt. Stas.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 384-387).—In the second study of this series (E. S. R., 90, p. 446) relative to the cation exchange properties of the fractions of Montalto silt loam and Colts Neck loam, the low exchange capacity of the sand separates in the A and B as compared with that of the C horizon was found to indicate degradation of the exchange complex, a definite sign of laterization. A comparison of the exchange capacity of laterites from Panama formed on parent material similar to that of the Montalto soil shows a great similarity between the two profiles. The comparatively high exchange capacity of the sand and silt fractions is not due to the clay fractions, some of which adhere to the coarse fractions during separation. In the clay fractions the higher exchange capacity of the A horizon is held due to the organo-mineral gels and to the residual organic matter. No difference in the exchange capacity of the different-sized clay fractions was apparent. A comparison of kaolinite, bentonite, Montalto clay, sol-

odized Chernozem, and laterite indicates that the Montalto clay fractions have an exchange capacity similar to that of laterite. The exchange capacity of the Montalto fractions is much higher than that of kaolinite, but lower than that of bentonite. There is no difference in the exchange capacity of the clay fractions in the B and C horizons. This indicates the stable conditions of a laterite type of weathering and of soil formation. In the solodized Chernozem, bentonitlike materials are believed probably to account for the high exchange capacity.

[*Soil Survey Reports, 1937 Series*] (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. [Soil Survey Rpts.]. Ser. 1937, Nos. 12, pp. 113+, illus. 7; 14, pp. 102+, illus. 7*).—Of these surveys No. 12 covers the Bakersfield Area, Calif., by R. C. Cole et al. (coop. Calif. Expt. Sta.); and No. 14, Washington County, Va., by R. C. Jurney et al. (coop. Va. Sta. et al.).

Physical land conditions on the Edwardsville Demonstration Project, Madison County, Illinois, E. N. STEELY. (*U. S. Dept. Agr. Soil. Conserv. Serv., Phys. Land Survey No. 26 (1943), pp. 39+, illus. 13*).

Soil capability work in Maryland, R. P. THOMAS. (*Univ. Md. (Soil Sci. Soc. Amer. Proc., 8 (1943), pp. 358-366)*).—The author discusses some of the limitations of soil capability class groups as prepared in the different areas of the State of Maryland. A slope, class, and stage of erosion table prepared from data from different areas of the State was found to reflect discrepancies in capability classification. A capability classification is developed wherein the soil series in the State are arranged in soil capability groups according to geographic areas. A discussion of the practices necessary for each of the soil classes to manage the soil to its normal maximum capacity and to conserve the soil is presented. Some other uses of soil capability tables and maps are noted.

Basal area in relation to soil-site factors in two Connecticut forests, H. A. LUNT and M. C. BALTZ. (*Conn. [New Haven] Expt. Sta. (Soil Sci. Soc. Amer. Proc., 8 (1943), pp. 415-419, illus. 1)*).—The authors reexamined in 1943 four forest tracts of even-aged mixed hardwoods on which studies were made in 1926-27 to determine what relationship, if any, existed between forest composition and soil type, for the purpose of correlating forest composition with general soil-site conditions irrespective of soil type per se. Using the strip method, they mapped the areas traversed on the basis of depth of solum, moisture conditions, slope and aspect, humus type, and thickness of the humus layer. The many varieties of soil-site conditions found in the field were ultimately reduced to five. Differences in average basal area per chain, 1 rod wide, ($\frac{1}{40}$ acre), on the several site conditions were subjected to the *t* test for significance.

Fifteen species comprised 87.9 percent of the total basal area of all tracts. Comparison of the average basal areas of the first 10 species on the 4 tracts and on the two most common site conditions by the analysis of variance showed no significant difference between tracts, nor between site conditions. Comparison of specific soil-site conditions by single species showed the following relationships: (a) Chestnut oak and black oak had significantly higher basal areas on the drier soils, while red maple, yellow birch, aspen, and blue beech excelled on the moister sites; (b) comparison of shallow and deep soils showed that black birch, red maple, white oak, black oak, scarlet oak, tulip, gray birch, and pignut hickory were more abundant on the deep soils, particularly on the drier sites; (c) white oak was the only species with greater basal area on steep north slopes. No correlation between the kind and amount of humus and forest composition was evident. Sixty percent of the area surveyed consisted of the one humus type, laminated mor. Ferns appeared more plentiful on moist sites and blueberries on dry sites, but laurel was indifferent in that respect.

Where soil and topographic maps are not available, soil-site maps should be made to accompany forest type maps.

Some physical and chemical properties of mature Podzol profiles, J. A. RICHARD and R. F. CHANDLER, JR. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 379-383, illus. 4).—The data presented in this paper were obtained from three strongly developed Podzol profiles in eastern Quebec Province, Canada.

The mechanical analysis showed a significantly higher content of clay-sized particles in the C and upper B horizons, than in the A₂ and lower B horizons. The exchange capacity was high in the B₂ horizon (39.2 milliequivalents) and low in the A₂ and C horizons. The percentage base saturation was lowest in the A₂ horizon and generally increased with depth. There was a general positive correlation between pH and percentage base saturation. The mineralogical analysis showed that very violent weathering of certain minerals had occurred in the A₂ horizon, whereas it was light in the C horizon. Hornblende weathered more readily than hypersthene, while garnet and zircon showed no evidence of weathering. The highest percentage of colloidal free iron oxide occurred in the B₂ horizon, while the highest value for free alumina appeared in the B₃ horizon. The combined water content of the colloids appeared to be related to the amount of free sesquioxides, primarily free alumina. The dehydration curves and the differential thermal curves of the colloid were strongly influenced by the free sesquioxides. Hydrogen peroxide acted as a dehydration agent on ferric hydroxide, but did not influence aluminum hydroxide. The data indicated that the free sesquioxides and hydrous mica constitute the greater part of the inorganic colloidal material and that the kaolinite content probably does not exceed 10 percent of the total colloid.

Some properties of the Black Prairie soils of Minnesota, C. O. ROST, P.-C. HSU, and T.-S. PANG. (Minn. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 388-390).—Of profile samples from the eastern and western portions of the Black Prairie region of Minnesota, the eastern group consisted of five and the western group of four profiles. The texture as expressed by the moisture equivalent, the reaction, inorganic carbonates, organic carbon, nitrogen, and exchangeable ions was determined on the individual profile samples of each group and these averaged.

The organic carbon, total nitrogen, carbon:nitrogen ratio, and exchange capacity of the two groups were similar. The groups differed somewhat in reaction and the quantities of exchangeable hydrogen, calcium, and magnesium. The eastern group, in which the precipitation is higher, was more acid and contained more exchangeable hydrogen and less exchangeable calcium and magnesium. Inorganic carbonates were found to have been leached from the solum and the upper part of the C horizon of the five members of the eastern group. In the western group carbonates were found in the lower part of the B horizon (below 20 in.), but a zone of lime accumulation was nowhere encountered.

Fundamental studies on some tomato-producing soils, J. B. HESTER (*Campbell Soup Co. Res. Monog.* 1 (1945), pp. 46+, illus. 7).—Eleven different soil types, seven from the Coastal Plain of New Jersey, two from the sandstone and shale belt of New Jersey, one from Ohio, and one from Illinois were investigated in the greenhouse. The soils were treated as follows: (1) No treatment; (2) fertilizer (12-24-24 N-P-K); (3) lime; (4) lime and fertilizer; and (5) lime, fertilizer, and trace elements. Tomatoes were grown, and yield records were kept and analyses made for sugars, vitamin C, titrable acids, and mineral and nitrogen content of the dried fruit. The amount of plant nutrients present in the soil, that taken out of the soil by the fruit, and that removed from the soil by leaching are summarized. On the acid soils, either fertilizer or lime increased the yield, but neither produced a satisfactory crop. Lime and fertilizer greatly increased the yield and quality, but the most satisfactory crop was obtained when lime, fertilizer, and trace elements were added. Sulfur, in the quantity used, was not beneficial to either the Ohio or Illinois soil. Fertilizer increased the titrable acids in the fruit when used on the soil with-

out lime, and lime alone decreased it. Fertilizer and lime, and fertilizer, lime, and trace elements improved the vitamin C, sugar, and general quality of the fruit in most cases. An average of the mineral and nitrogen content of the dried fruit produced on the lime and fertilizer and lime-fertilizer-trace element pots for all soils discussed is as follows: Calcium 0.050, magnesium 0.115, potassium 1.40, calcium-magnesium-potassium 1.465, phosphorus 0.40, and nitrogen 2.00 milliequivalents per gram. The author suggests that this has some significance in connection with fertilizer practices in tomato growing.

Physical characteristics of soils.—VII, Effect of ignition, A. N. PURI and A. G. ASGHAR (*Soil Sci.*, 49 (1940), No. 5, pp. 369-378, illus. 7).—Using soils that were acid-treated to remove exchangeable bases, the changes brought about by heating on physiochemical properties were investigated by determination of titration curves, base-exchange capacity, reaction with ammonia, production of free alkali, dispersion, destruction of humus and decomposition of calcium carbonate, loss of weight on ignition, moisture absorption, puzzolonic properties, sticky point and rolling limit, and aggregate analysis. A progressive decrease in colloidal properties was suggested as being due to fusion of the smaller particles, resulting in stable aggregates which cannot be disintegrated by ordinary methods of dispersion. Previous articles of the series have been noted (E. S. R., 83, p. 306).

Food or famine: The challenge of erosion, W. SHEPARD (*New York: Macmillan Co.*, 1945, pp. 225+, illus. 18).—This book presents a discussion of the relation of erosion to civilization. War and erosion are considered as twin scourges of civilization. Information is presented on the extent of erosion and on the need for careful planning for maximum soil conservation. Several illustrations are included.

Water storage limitations in forest soil profiles, C. R. HURSH. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 412-414).—This discussion emphasizes existence of definite physical limitations, inherent to shallow or eroded soil profiles, upon the underground water storage in many forest soils. Because of limited soil depth, upper slopes of the southern Appalachian Mountains above 3,500 ft. may have 4 to 8 area inches less total storage opportunity than lower slopes or terrace lands in the same locality. Eroded soil profiles of the southeastern Piedmont that have been abandoned after many years of clean cultivation may have less than one-third the macropore storage in the first 36 in. than is found in comparable soil types that have not been cleared for agriculture. Consequently, the young pine stands that invade badly eroded land do not have the initial water control and ground-water storage found in the uncleared forest.

Mulch culture in relation to soil and water conservation and corn yields in Iowa, G. M. BROWNING, R. A. NORTON, and C. K. SHEDD. (Iowa Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 424-431, illus. 4).—The loss of soil from plots on Marshall silt loam plowed and surface planted, subsurface tilled, loose-ground listed, and loose-ground listed with cover crop was 34.1, 9.9, 2.3, and 0.3 tons per acre, respectively, during the period January 1 to November 1, 1943. In 1942 and 1943 the yield of corn on plots under various cultural treatments on Marshall silt loam was in the order plowed and surface planted > hard-ground listed > loose-ground listed > subsurface tilled. Cultural treatments and methods of handling residues did not affect the yield on the Clarion soils when the previous crop was corn, but when the previous crop was sweetclover, the yields on subsurface tilled plots were reduced as compared to those on the plowed plots. On the Webster silty clay loam soil the yields from the subsurface tilled plots were consistently lower than from plots plowed and surface planted. Stands for the different cultural treatments on the Marshall silt loam were in the order plowed and surface planted > subsurface tilled > hard-ground listed > loose-ground listed. Stand had an important effect on yields. Cultural treatment also affected yields

as shown by the differences in yield per stalk. The values were lowest on the subsurface tilled plots and highest on the plowed and surface planted plots. Labor input and power requirement in the preparation of seedbeds and planting were reduced one-third to one-half by using the various mulch culture implements as compared to the requirements when the plow was used for primary seedbed preparation. Corn plants on plowed plots in July were significantly taller than plants on the subsurface tilled plots.

Some major factors in the leaching of calcium, potassium, sulfur, and nitrogen from sandy soils: A lysimeter study, G. M. VOLK and C. E. BELL (*Florida Sta. Bul. 416 (1945), pp. 23, illus. 5*).—Tank type lysimeters filled with 4-ft. profiles of Norfolk loamy fine sand were used to obtain information on the significance of plant feeding and fertilizer placement and compositions on the extent of nutrient losses under Florida conditions.

The growing of turnips reduced leaching water loss from 13.15 in. of precipitation by 4.3 in. during a 3-mo. period. The turnip crop assimilated the equivalent of 118 percent of the potassium, 86 percent of the nitrogen, 41 percent of the calcium, and 19 percent of the sulfur applied as a 5-7-5 fertilizer supplement with calcium and sulfur. Evaporation from fallow soil during the same period was 3.87 in., or 29.4 percent of the rainfall. A crop of millet reduced loss from a 21.63-in. rainfall between May 10 and September 2 by 7.19 in., or 63 percent. Evaporation from a fallow soil accounted for 10.21 in., or 47.2 percent of the rainfall for the same period. Evaporation from fallow soil under a rainfall of 45.09 in. between December 29 and September 19 was 17 in., or 37.9 percent of the rainfall. The combined turnip and millet crops reduced leaching by 8.91 in., or 39 percent, for the same period. Leaching under the millet crop began when the accumulated monthly rainfall reached 7.4 in. and from the fallow soil when the rainfall accumulation reached 1.7 in. during the same period.

Leaching loss was reduced from 50 to 90 percent by a turnip crop when fertilized with 2,000 lb. of 5-7-5 fertilizer. Calcium loss was 36.6 lb. per acre from a broadcast placement and 28.3 lb. from band placement. Potassium loss was 0.82 lb. from the broadcast and 0.62 lb. from the band. Sulfur loss was 19.3 lb. from the broadcast and 5.8 lb. from the band. Nitrogen loss was 13.6 lb. from the broadcast and 14.5 lb. from the band. Calcium and sulfur loss was of the same order, though of greater magnitude, from fallow soils of similar treatment. Potassium loss was of reverse order, being 3.30 lb. from the broadcast and 8.85 lb. from the band. Nitrogen loss was approximately 112 lb., or equivalent to 112 percent of the application, in both instances under fallow treatment. The order of appearance of the various ions indicated that $\text{Ca}(\text{NO}_3)_2$ dominated the soil solution and retarded the movement of sulfates until nitrate nitrogen had passed its crest of concentration as a result either of leaching or of plant utilization of nitrates. The leaching of potash was apparently retarded as an indirect effect of the reduction of solubility of sulfates by the $\text{Ca}(\text{NO}_3)_2$.

Chemical treatment of "slick spots," J. W. FITTS, E. S. LYONS, and H. F. RHOADES. (Nebr. Expt. Sta.). (*Soil Sci. Amer. Proc.*, 8 (1943), pp. 432-436, illus. 2).—Sulfur, gypsum, and calcium chloride treatments all increased the rate of intake of water by slick spots, but sulfur was the most effective except for a short time following the application. All treatments reduced the percentage of clods larger than $1\frac{1}{4}$ in., sulfur being more effective than the other treatments and the only treatment to lower the resistance of the large clods to crushing. Alfalfa roots did not penetrate below a depth of 9 in. in the untreated, calcium chloride, or gypsum-treated plots, although a vigorous growth of lateral roots occurred in the treated plots. Roots in the sulfur-treated plots penetrated to coarse sand at a depth of 40 in. In one field the treatments reduced the pH and the exchangeable sodium content

of the surface soil but had little effect on those properties below a depth of 9 in. Only the 6,000-lb. sulfur treatment had a marked effect on the pH and exchangeable sodium content of a second field.

The improvement in stand and in growth of alfalfa as a result of chemical treatment appeared due to an improvement in the physical condition of the soil and, in the instance of the 6,000-lb. sulfur treatment, to a lower pH and to a decrease in saturation with exchangeable sodium with a resulting increase in available calcium.

The measurement of soil water, C. S. SCOFIELD. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 71 (1945), No. 9, pp. 375-402, illus. 6).—This article discusses the three current methods for determining soil moisture: (1) The gravimetric method, in which soil samples are weighed and dried to constant weight, and from the loss of weight the water content is computed; (2) an electrometric method, involving the measurement of the electrical resistance between two electrodes embedded in a block of gypsum placed in the soil; and (3) the tensiometric method, which involves the measurement, with a mercury manometer, of the tension existing between the soil and its water.

Detailed records of tensiometric observations at a number of field locations with a number of different crops are presented. It was found possible to establish an acceptable relation between the data of tensiometric observations at any given field location and the quantity of available soil water at that location. This finding makes it possible to make up, for the soil of any given field location, a conversion table by the use of which the data of tensiometric field observations may be translated into (1) equivalent gravimetric percentages of available soil water, (2) equivalent volumetric percentages of available soil water, or (3) equivalent gravimetric or volumetric percentages of total soil water. Several methods of procedure to this end have been explored, and three of these methods are described.

The author points out that there is an inverse relationship between tension and available soil water. Thus it is possible to determine for the soil of any field location (1) the quantity of the unavailable soil water and (2) the quantity of the available soil water corresponding to any observed tension. Three different methods for the tensiometric calibration of the soil are described, together with a method for evaluating the water-relation characteristics of the soil.

Factors contributing to landslides in the Palouse region, L. T. KARDOS, P. I. VLASOFF, and S. N. TWISS. (Wash. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 437-440, illus. 8).—The occurrence of slips in the instances cited is considered intimately related to the presence of the siliceous layer as a weak link in the chain of cohesion, to the further deterioration of this link due to its being fed with water from melting snowdrifts, and to the uplift action of a perched water table. Hence, prevention of slip in similar situations would seem to be largely dependent upon the prevention of excessive accumulation of snow on the northerly slopes by means of vegetative drift fences properly placed on ridges and hilltops and upon the use of the slip area of rotations or permanent vegetative covers which will be strongly exhaustive of soil moisture and thereby maintain a higher state of capillary tension and, hence, internal friction. Any practice which would decrease the frequency with which the siliceous layer might become lubricated with a perched water table would also be helpful.

Amount and mineral nutrient content of freshly fallen needle litter of some northeastern conifers, R. F. CHANDLER, JR. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 409-411).—The author reports upon a study of the annual leaf litter deposition from seven common conifers of the northeastern United States, the litter samples having been analyzed for calcium, magnesium, potassium, phosphorus, and nitrogen.

The average annual litter fall (needles only) was 2,463 lb. of oven-dry material per acre. The calcium content of the litter varied from 0.58 percent for red pine

to 2.16 percent for white cedar. The nitrogen content varied from 0.60 percent for white cedar to 1.25 percent for balsam fir. The potassium content varied from 0.12 percent for balsam fir to 0.39 percent for Norway spruce. The magnesium content showed little variability among species, ranging from 0.14 percent for hemlock to 0.21 percent for white pine. The phosphorus content was very low, ranging from 0.04 percent for white cedar to 0.10 percent for red spruce. The average total quantities of nutrients returned annually to an acre of ground, expressed in pounds per acre, were calcium 26.5, nitrogen 23.6, potassium 6.5, magnesium 4.5, and phosphorus 1.8.

Die Tripelanalyse: Theoretische und praktische Grundlagen einer pflanzen-physiologischen Methode zur Bestimmung des Düngerbedürfnisses des Ackerbodens [Theoretical and practical foundation of a plant physiological method for the determination of the fertilizer requirements of cultivated soils], H. LUNDEGÅRDH (*Lantbr. Högsk. Ann. [Uppsala]*, 9 (1941), pp. 127-221, illus. 30).—This paper is of the nature and proportion of a monograph upon the author's methods for determining the fertilizer requirements of cultivated soils. Its contents are an introduction; nomenclature; general exposition of a laboratory method for fertilizer requirement determinations; experimental methods; the scientific bases of the triple analysis procedure, the practical application of the triple analysis and the reliability of the analysis; mathematical demonstrations of the dependence of the yield increase in the indicator values; and the practical application and the dependability of chemical soil analysis. A bibliography is appended.

Production of artificial manure, F. B. SMITH and G. D. THORNTON (*Florida Sta. Bul.* 415 (1945), pp. 20, illus. 5).—This bulletin presents a discussion of the conditions necessary for the decomposition of plant materials and methods of composting under Florida conditions. Composts were made from water hyacinth, pine needles, Spanish-moss, and Spanish-moss gin waste. Ammonium sulfate, cottonseed meal, cyanamid, urea, and horse manure were used as sources of nitrogen. Rock phosphate, superphosphate, and basic slag were used as sources of phosphorus.

Composts made from water hyacinth were fairly well decomposed after 4 mo. Analyses showed that even without the addition of minerals a fair grade of manure could be made from the water hyacinth and that decomposition was fairly rapid. However, addition of minerals produced a better grade of compost. Nitrification tests showed that the nitrogen contained in the compost made from water hyacinth was readily available. Composts made from pine needles were not sufficiently decomposed after 6 mo. to prevent the mobilization of nitrogen in the soil and even after 12 mo. the composted pine needles were not well humified. Spanish-moss and moss gin waste were not well decomposed after nearly 3 mo.

Inspection of [fertilizers], J. J. HAVERN and C. H. STETSON, JR. (*Rhode Island Sta. Ann. Feed and Fert. Ctr.*, 1945, pp. 7-11, 46-54).—The 1945 results of the chemical analyses for fertilizers are reported. The products are indicated as acid-forming or non-acid-forming.

AGRICULTURAL BOTANY

Collecting data and specimens for study of economic plants, W. A. ARCHER (*U. S. Dept. Agr., Misc. Pub.* 568 (1945), pp. 52, illus. 34).—"Persons engaged in field work, especially in foreign countries, have a unique opportunity to make valuable contributions to the scientific and practical knowledge of agricultural crops as well as wild-plant products. These contributions may be pressed specimens for identification of the plants, material for study of plant diseases and insect pests, plant products for analysis, and seed or other material for propagation. Good photographs or reports describing economic plants, crops, and agricultural practices add greatly to the value of specimens. The purpose of this pamphlet is to

instruct interested persons in proper methods of gathering, preparing, and shipping such specimens. It is essential that specimens be carefully prepared and that the information accompanying them be complete and accurate."

Ethnobotany of the Navajo, F. H. ELMORE (*Albuquerque: Univ. N. Mex. Press*, 1943, pp. 136).—This contribution is the result of 7 yr. of intermittent work on Navajo ethnobotany, begun in 1936. Most of the field work was done at the Research Station of the School of American Research and the University of New Mexico, Chaco Canyon National Monument, N. Mex.; the library work was done in several southwestern libraries. Three summers were spent working first hand with Navajo informants. Following a general discussion of the ecology of the area covered and the Navajo uses of plants and a key to language sounds, the main body of the text is taken up with the individual plant species systematically arranged from the algae through the composites. Appendixes list plant products and by-products, general terms for plants, and include an annotated list of plant parts. Also listed are medicinal plants and their uses, ceremonial plants, food plants and food accessories, wood plants, dye plants and dye accessories, basketry plants, forage and browse plants, gaming plants, beverage plants, and miscellaneous plant uses. A summary of plant families with number of genera and species of each is tabulated. A selected bibliography (87 references) and Navajo, scientific, and general indexes complete the volume.

Shadowed electron micrographs of bacteria, R. C. WILLIAMS and R. W. G. WYCKOFF (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 265-270, illus. 9).—Metal shadow-cast preparations under electron microscopy revealed many details of bacterial morphology. The three-dimensional effect achieved by this technic brought out with special clarity the shapes of organisms and the contours of their surfaces; shadowing also rendered evident their flagellar and other extra-cellular processes. Illustrative shadowed electron photomicrographs are presented of subtilislike and typhoidlike bacteria and several coccus forms.

The corrosion of concrete, I, II, C. D. PARKER (*Austral. Jour. Expt. Biol. and Med. Sci.*, 23 (1945), No. 2, pp. 81-98, illus. 4).

I. *The isolation of a species of bacterium associated with the corrosion of concrete exposed to atmospheres containing hydrogen sulphide* (pp. 81-90).—Five strains of H_2SO_4 -forming bacteria were isolated from corroded concrete exposed to atmospheres containing H_2S . Their morphological, cultural, and biochemical properties are described and believed to warrant differentiation as strains of a new species of sulfur bacteria provisionally named *Thiobacillus concretivorus*.

II. *The function of Thiobacillus concretivorus (nov. spec.) in the corrosion of concrete exposed to atmospheres containing hydrogen sulphide* (pp. 91-98).—The organism has been isolated in large numbers from specimens of corroded concrete obtained under different conditions and from widely separated localities; conditions existing in corroding concrete were satisfactory for its growth. Rapid and typical corrosion of cement mortar exposed to atmospheres similar to those in sewers occurred only in the presence of pure cultures of *T. concretivorus*. It did not utilize H_2S directly but did convert free S or some other utilizable form—probably produced nonbiologically—into H_2SO_4 . The process of concrete erosion under sewer conditions is discussed, and it is concluded that the final rapidly corrosive stage is due to the activity of this sulfur organism; explanation of the preliminary stage of slow erosion is not yet clear.

Studies on the Coccaceae.—XVIII, *The enterotoxin-producing micrococci*, W. C. HAYNES and G. J. HUCKER (*New York State Sta. Tech. Bul.* 275 (1945), pp. 82, illus. 15).—The results of an investigation of 114 strains of micrococci associated directly or indirectly with gastrointestinal disturbances have indicated that the enterotoxin-producing strains are more frequently pigmented, form acid from lactose

and maltose, and grow on alkaline media in the presence of bromothymol blue; the more active of these strains usually liquefied gelatin and hemolyzed washed rabbit red cells. The ability to form coagulase correlated in very high degree with enterotoxin production. The optimum temperatures for determining gelatin liquefaction were incubation at 25° C., followed by hardening for 4 hr. at 21°. Precipitin reactions did not prove usable for determining these strains, though certain correlations were found when HCl was used as a precipitant in preparing specific precipitin substances. Except in low concentrations, phosphotungstic acid completely removed precipitin-reacting substances from *Micrococcus* cells. The authors conclude that micrococci vary considerably in enterotoxin production among different strains as well as in the same strain, and that this character is not specific but one that can be assumed under unknown conditions by certain pathogenic micrococci—the gelatin-liquefying hemolytic, usually orange-pigmented types. In determining the cause of food poisoning epidemics, the presence of a large number of these forms is deemed presumptive evidence that they may have been the cause. There are 44 references.

The bacterial cell in its relation to problems of virulence, immunity, and chemotherapy, R. J. DUBOS (*Cambridge: Harvard Univ. Press; London: Oxford Univ. Press, 1945, pp. 460+*, illus. 86).—A considerable body of knowledge concerning the biological and chemical architecture of bacteria is slowly emerging. It is the purpose of the present volume to integrate this information from various indirect methods with the data obtained by the classical technics of cytology and to interpret some of the phenomena of the infectious process in terms of the biochemical architecture of the bacterial cell.

Bacitracin: A new antibiotic produced by a member of the B[acillus] subtilis group, B. A. JOHNSON, H. ANKER, and F. L. MELENEY (*Science, 102 (1945), No. 2650, pp. 376-377*).

Antibiotics from moulds, J. KENT and N. G. HEATLEY (*Nature [London], 156 (1945), No. 3958, pp. 295-296*).—The antibiotic isolated from various fungi and for which the structure anhydro-3-hydroxymethylene-tetrahydro- γ -pyrone-2-carboxylic acid has been proposed is shown to be responsible for at least part of the antibiotic activity said to be produced by *Penicillium urticae*, *Aspergillus terreus*, and *P. expansum*. There are 11 references.

Origin of toxicity to fungi in Wareham Heath soil, M. C. RAYNER (*Nature [London], 156 (1945), No. 3954, p. 174*).—A brief discussion of the discovery by Brian et al. of marked antibiotic activity by *Penicillium* spp. in this soil (E. S. R., 93, p. 690) in connection with the present author's work along similar lines.

The Laschia-complex (Basidiomycetes), R. SINGER (*Lloydia, 8 (1945), No. 3, pp. 170-230, illus. 14*).—This contribution fulfills an attempt to redefine the various groups of these fungi and to dispose of them within the framework of a natural classification of the Basidiomycetes. Identification keys and an index to the genera are provided, and much new taxonomy is involved. There are 28 references.

Keys to 2,500 Texas plants, E. R. BOGUSCH (*Kingsville: Tex. Col. Arts and Indus., 1945, pp. 226+*).—The species covered—somewhat over 2,500—were selected to include as far as possible those found over a wide range and were chosen to be representative of Texas as a whole. The keys represent over 15 yr. of experience in laboratory and field; they have been written to use, wherever possible, the most conspicuous features of the plant. The manual is intended for use by students and those interested in the identity of plants rather than by professional botanists; common names not previously published have been added in a number of cases. A glossary and a subject index are provided.

Early flowering of plants in 1945, R. T. CLAUSEN. (Cornell Univ.). (*Torreyia, 45 (1945), No. 3, pp. 65-67*).—In 1945, March and April were remarkable in the northeastern United States for the prolonged warm weather. A list is presented of

209 species from the Ithaca (N. Y.) region, with the 1945 date of first ripe pollen observed for each; a similar survey in 1943 revealed 45 species in bloom before May 1 and in 1944 50 species were so recorded.

Growth factor studies with *Spirodela polyrrhiza* (L.) Schleid, P. R. GORHAM (*Amer. Jour. Bot.*, 32 (1945), No. 8, pp. 496-505, illus. 11).—"Considerable controversy has attended the question as to whether organic manures, humus, peat, or soil are able to supply small amounts of organic materials which promote the growth of green plants, or whether these substances correct recognized or unrecognized inorganic deficiencies." This study—using duckweed—was carried out by techniques described for obtaining micro-organism-free culture under controlled light and temperature and for photometrically determining frond areas. The frond multiplication rate rose with increased light, supplemental CO₂, or added sucrose. Forced aeration with CO₂ promoted frond multiplication even with optimum sucrose concentrations, while increased light heightened the effects of both treatments. Frond size increased with added sucrose or improved O₂ supply but was not affected by supplemental CO₂ or increased light. Under a light intensity of 300 ft.-c. and suitable concentration, an aqueous extract of sphagnum peat greatly increased the rate of frond multiplication and decreased the frond size and fresh weight in sucrose and to a lesser extent in non-sucrose culture. Under the same conditions, aqueous extracts of cow or horse dung increase the rate of frond multiplication and of frond size and fresh weight in sucrose culture only. The three extracts, when ashed, had little growth-promoting activity. Dried cow dung contains a fraction that promotes frond multiplication and is insoluble in acetone and methanol but soluble in ether; it also contains an inhibitor fraction which is soluble in acetone and methanol but insoluble in ether. As revealed in one instance, certain bacterial contaminants may greatly promote the growth of *Spirodela* in sucrose solution. Plants grown on a sucrose medium in the light were capable of limited frond multiplication and development after transfer to a sucrose medium in darkness; those transferred to a medium without sucrose remained in a static condition but resumed growth in darkness when replaced on a sucrose medium. Frond multiplication increased proportionally with added asparagine. This effect depends for full expression on previous treatments of the inoculum in light, since substances limiting growth in darkness accumulated appreciably only in a sucrose culture. Tests of 16 amino acids and numerous growth-promoting substances indicated that all of them were unable to replace asparagine in its effect on meristematic activity. There are 22 references.

The influence of nitrogen nutrition upon the ascorbic acid content of several vegetable crops, A. H. FINCH, W. W. JONES, and C. W. VAN HORN. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 314-318).—Data are presented in support of previous work with grapefruit (E. S. R., 94, p. 63), in which an inverse N-ascorbic acid relation was found. The authors do not imply that this situation holds for all climatic conditions, since the amount of ascorbic acid reported for grapefruit is believed to represent the difference between that synthesized and the amount utilized. In the arid Southwest, however, where light intensities are high and appear ample for photosynthesis, N seems to exert an important regulatory effect on the ascorbic acid content of the fruit or vegetable.

Parthenocarpic production of tomato fruits, T. SWARBRICK (*Nature [London]*, 156 (1945), No. 3958, pp. 300-301).—Two new lines of investigation to induce parthenocarpy in tomatoes are briefly reported, viz, the use of synthetic animal hormones of the estrogen type and that of crude extracts of tomato flowers. These studies are believed to offer an important approach into problems of fruit setting and development in tree fruits; they may have far-reaching applications in orchard practice in relation to pollination and sterility.

An analysis of the process of root formation on cuttings of a difficult-to-root hibiscus variety, L. E. GREGORY and J. VAN OVERBEEK (*Amer. Soc. Hort. Sci.*

Proc., 46 (1945), pp. 427-433, *illus.* 6).—The authors' experiments discussed here and elsewhere demonstrate that for the rooting of the common red and the white-flowered varieties of hibiscus two distinct factors acting coordinately are necessary, viz, auxin and a substance (or substances) produced by the leaves. Cuttings of the white variety are difficult to root because they are deficient either in auxin or in the active material produced in the leaves; when both factors are provided, roots of this difficult variety are readily produced. The reasons given for deficiency in the second factor are an early shedding of leaves from cuttings of the white hibiscus and a lower effective content of the material in this than in the red variety—a deficiency revealed by differences in root formation on detached leaves of the two varieties. The chemical nature of the root-forming substance is now being investigated; preliminary results seem to indicate that it consists, at least in part, of substances which may be classified as nutritional factors. The possibility is not excluded, however, that hormonal factors other than auxin may also be involved.

Development of plants as affected by negative temperatures, Z. A. KULCHITZ-KAYA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 47 (1945), No. 5, pp. 366-369).—In the experiments described winter wheat sown in spring surpassed the regional varieties of summer wheat after being vernalized for 32 days with subsequent chilling. The effect of low ("negative") temperatures applied along with vernalization is suggested as one of the conditions necessary to plant development. It is concluded that a temperature of -2° C. at a definite stage of vernalization enhances the development of winter crops and increases their productivity.

Water relations of pocosin or bog shrubs, M. G. CAUGHEY (*Plant Physiol.*, 20 (1945), No. 4, pp. 671-689, *illus.* 6).—The pocosins, or broad-leaved evergreen shrub bogs, are said to constitute one of the most distinctive plant communities of the southeastern coastal plain of the United States; this paper comprises a review of the subject (34 references) and an ecological and physiological study of a pocosin in Beaufort County, N. C.

Some comparisons of chemical ontogeny with chemical phylogeny in vascular plants, J. B. McNAIR (*Lloydia*, 8 (1945), No. 3, pp. 145-169).—"There are resemblances between certain characters in the embryos of higher animals and corresponding stages in the embryos of lower animals. . . . If this holds even partially true in plants, then we have a pattern which may aid in the phylogenetic classification of plants on the basis of their chemical products; a method to aid in the discovery of 'missing links' in the formation of certain compounds along the phylogenetic chain; as well as a pattern for the study of chemical ontogeny through the study of chemical phylogeny." This is a review (49 references) and critical discussion of the subject.

A dibasal (minimum salt, maximum yield) solution for *Aspergillus niger*; acidity and magnesium optimum, R. A. STEINBERG. (U. S. D. A.). (*Plant Physiol.*, 20 (1945), No. 4, pp. 600-608).—When *A. niger* was grown at 35° C. for 4 days, absorption of Mg but not of other macronutrients was altered by variations in acidity; values in acidity-yield curves depended on variations in the Mg and micronutrient contents of the medium. The dibasal solution (minimum salt solution for maximum yield) was found to contain all the nutrient elements in minimum amounts, as determined in quantity-yield tests with each. Maximum yields can therefore be obtained when all essential elements are present in minimum quantity. The fungus requires no more than 106 mg. of macronutrient salts per gram of substance formed. Possible methods for computing the approximate composition of the dibasal nutrient solution for other organisms are indicated.

Bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition (*New York: Chilean Nitrate Ed. Bur., Inc.*, 1945, 3 ed., Sup. 6, pp. 103+).—A sixth supplement to the third edition (E. S. R., 92, p. 29), originally compiled by L. G. Willis.

Use of microorganisms to determine essentiality of minor elements, R. A. STEINBERG. (U. S. D. A.). (*Soil Sci.*, 60 (1945), No. 2, pp. 185-189).—Studies of minor elements in relation to fungi antedate those with other organisms; fungi were also the first to be used for studies of vitamins and antibiotics. Major advances in these fields had their inception in studies of *Aspergillus*, *Penicillium*, *Phycomyces*, and *Saccharomyces*. It is concluded in this brief review (4 references) and discussion that the mineral requirements of *A. niger* agree with those of green plants except for Ca, Si, and B; it can therefore be used as a test organism when speed, accuracy, and precision are required or when aseptic conditions or those of extreme purity are necessary. Comparative studies of its requirements and metabolism with those of other fungi and green plants should aid in revealing the biological functions of the chemical elements in plants.

Minor elements and vitamin content of plants, K. C. HAMNER. (U. S. D. A.). (*Soil Sci.*, 60 (1945), No. 2, pp. 165-171).—"So little work has been in this field of minor elements in relation to the vitamin content of plants that this review [32 references] can do but little more than indicate this fact." It is believed that variations in the ascorbic acid content such as might be encountered in the field are influenced so markedly by differences between varieties and by climatic conditions that the possible influence of soils and fertilizers will be found to have little practical importance. It also seems probable that any fertilizer treatment or lack of treatment which causes the development of chlorosis in the plants will be likely to decrease the carotene content of the leaves. As to both carotene and ascorbic acid, it is fortunate from a practical standpoint that previous results indicate that those treatments which are likely to give the highest crop yield per acre are also the ones most likely to give the highest vitamin yield per acre.

The role of boron in plant metabolism—II, An account of some attempts to isolate boron-complexes from plant tissues, M. E. WINFIELD (*Austral. Jour. Expt. Biol. and Med. Sci.*, 23 (1945), No. 2, pp. 111-117).—In this installment (E. S. R., 93, p. 133) a theoretical basis is developed for further study of the biochemistry of B; it is suggested that B enters the plant as boric acid, thereupon combining with one or more of the polyhydroxy compounds in the cell. A number of such compounds are cited which can form complexes with boric acid under certain conditions, and it is shown by conductivity measurements in dilute solution that one of the most probable complexes in the plant cell is that formed by pyridoxine. The ways in which the chemical properties of boric acid may be utilized by plants in oxidation and in condensation processes are illustrated by reactions involving pyridoxine and riboflavin. Attempts to isolate a boric acid complex in its native state from plant material were unsuccessful. Addition of pyridoxine to the culture solution had no appreciable influence on absorption of B or appearance of B-deficiency symptoms in squash plants grown in culture solutions from which B was lacking. Inhibition by boric acid of the oxidation of ascorbic acid in the absence of heavy metals was small and believed unimportant. Production of borocitrine by *Penicillium glaucum* in the presence of boric acid was not confirmed. A new carbohydrate was isolated from B-deficient squash leaves.

A note on the effects of copper impurities in distilled water on growth of plants, T. C. BROVER and A. H. FURNSTAL. (Univ. Calif.). (*Plant Physiol.*, 20 (1945), No. 4, pp. 690-691).—In certain controlled nutrient solution studies with sugar beet and barley, a toxicity found associated with the supply of distilled water was shown to be due to Cu from tin-lined copper tanks in which areas of exposed Cu were evident. Though the water issuing from the tin-lined copper still proved relatively low in Cu, its content increased the longer the water was retained in the defective reservoir.

Iron in leaves, J. P. BENNETT. (Univ. Calif.). (*Soil Sci.*, 60 (1945), No. 2, pp. 91-105).—Most investigations on Fe in plants have dealt with its deficiency as dis-

played in chlorosis. The most common cause of Fe chlorosis is an excess of lime in the soil; this, on account of the resulting milk alkalinity, makes Fe less available but does not directly injure the plant. Consideration of the subject in this review and discussion (12 references) is limited to leaf Fe, which has received much attention because it is in the leaves that the immediate effects of deficiency are seen. Various suggestions have been offered to explain chlorosis as due to the inactivation of Fe mainly by excesses of other elements in chlorotic leaves. Inactivation has thus been ascribed to excess of P, K, and Mn; the relations of these elements are discussed. Other matters receiving attention are surface contamination of leaves by Fe, sampling and calculation of Fe, Fe and chlorophyll in pear leaves, active and residual Fe, and N and chlorophyll in relation to Fe.

Certain factors affecting the availability, absorption, and utilization of magnesium by plants, H. P. COOPER. (S. C. Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 2, pp. 107-114).—The role of Mg as one of the essential elements for plant growth is critically reviewed (20 references); Mg is usually present in sufficient amounts in most soils, but in the sandy loam soils of humid regions there may not be enough available for optimum growth of many crops. Many plants appear to absorb the relatively strong ions selectively, and the quantity of Mg in most plants is significantly lower than that of K or Ca. The standard electrode potentials, ionization potentials, and the solubility of compounds of Mg are useful in interpreting its behavior in the soil colloidal complex and its absorption by plants. Mg is the strongest metallic constituent of chlorophyll. The quality of radiant energy available in sunlight and that absorbed by chlorophyll suggests that Mg is one of the strongest metallic cations that could be readily assimilated in combinations with such relatively light-stable anions as carbonate and phosphate. The Mg requirements of most soils can be supplied by broadcast application of a ton or more per acre of dolomitic limestone; this should supply the Mg requirement for a number of years. Use of dolomite in the production of non-acid-forming complete fertilizers will usually supply the annual Mg requirement for most crops. Where it is desirable not to change significantly the soil reaction for such crops as bright leaf tobacco and certain vegetables and ornamentals, an application of the equivalent of 20 to 30 lb. of Mg in the form of sulfate of potash-magnesia, sulfate of potash, or Kieserite is said to be the most satisfactory treatment for acute cases of Mg deficiency. Where water-soluble Mg salts are used, it may be desirable to make annual or frequent applications, since soluble Mg salts may be leached from the soil.

The rôle of manganese in agriculture, J. S. McHARGUE. (Ky. Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 2, pp. 115-118).—"Manganese is one of the so-called minor chemical elements which in recent years has been shown at this experiment station and elsewhere to have important functions in the economy of soils, plants, and animals." The results of these various investigations are critically analyzed and discussed (31 references), with resulting conclusions.

Molybdenum in relation in plant growth, D. R. HOAGLAND. (Univ. Calif.). (*Soil Sci.*, 60 (1945), No. 2, pp. 119-123).—During recent years evidence has been forthcoming to warrant special consideration of Mo as an addition to the list of chemical elements essential to higher plants. The author critically reviews the literature (16 references), including attention to Mo deficiency and toxicity.

Studies on the metabolism of mould fungi, I, II, T. MANN (*Biochem. Jour.*, 38 (1944), No. 4, pp. 339-351, illus. 2).—The following are included:

I. Phosphorus metabolism in moulds (pp. 339-345).—Mold fungi with a predominantly aerobic carbohydrate metabolism also have a characteristic P metabolism, absorbing orthophosphate aerobically and converting it into a number of P compounds. The rates of P absorption and utilization depend on the initial concentration in the culture medium. Cultures grown in the presence of large concentrations of phosphate developed more rapidly than with low concentrations, gave a higher

respiratory quotient, utilized glucose more rapidly, produced more citric acid, had a higher N metabolism, and exhibited a substantially increased content of certain vitamins. Cyanide, azide, iodoacetate, and fluoride strongly inhibited the respiration of these molds and brought the P metabolism to a standstill. A large proportion of the orthophosphate absorbed aerobically was converted to acid-hydrolyzable compounds. Formation of P compounds in the mycelium reached its peak at the preconidial stage; during autolysis they were decomposed and excreted into the medium as orthophosphate. The occurrence of a metaphosphatase in both the mycelium of *Aspergillus niger* and in the medium is described; the enzyme was purified and separated from glucose oxidase. Whereas the activity of the latter is considerably reduced by 0.01-N-NaNO₃, the phosphatase remained intact.

II. *Isolation of pyrophosphate and metaphosphate from Aspergillus niger* (pp. 345-351).—Two easily acid-hydrolyzable P compounds were isolated in pure form from the mycelium. One was identified as pyrophosphoric acid and obtained as crystalline sodium pyrophosphate; the other, as metaphosphoric acid and obtained as sodium, ammonium, and barium metaphosphates. Chemical and enzymic methods were developed which—together with the protein precipitation test—made it possible to distinguish between pyrophosphoric and metaphosphoric acids. The mycelium also contained a difficulty acid-hydrolyzable P compound obtained in the form of a water-soluble barium salt.

The mineral composition of phosphate deficient cells of *Chlorella pyrenoidosa* during the restoration of phosphate, G. T. SCOTT (*Jour. Cell. and Compar. Physiol.*, 26 (1945), No. 1, pp. 35-42, illus. 2).—"There is little information concerning either the chemical composition of unicellular plants grown in deficient media or the recovery of the cells from the deficiencies acquired under such conditions." In mass cultures of this alga grown in a phosphate-deficient medium, the phosphate absorbed by the deficient cells either in light or darkness proved to be independent of the P concentration in the medium except at the limiting concentrations of phosphate normally required by the cell. The amount of K absorbed depended on the amount of P taken in by the cells. The absorption ratio of K and P in light or darkness was about 1 : 1 atoms. It is assumed that P and K combine chemically with some constituent of the cell produced by photosynthesis. Ca and Mg were not absorbed concomitantly with P and by phosphate-deficient cells. After cessation of the exponential growth phase there was an increase in the concentration of P, K, Ca, and Mg in the cell.

Effects of potassium on chlorophyll, acidity, ascorbic acid, and carbohydrates of *Ananas comosus* (L.) Merr., C. P. SMERIS and H. Y. YOUNG. (Pineapple Res. Inst. Hawaii). (*Plant Physiol.*, 20 (1945), No. 4, pp. 649-670, illus. 3).—The amounts of chlorophyll and carotenoid pigments in pineapple leaves were unaffected by the amounts of K in the cultures; certain differences found were believed due to the different kinds of N, since the effects of NH₄ v. nitrate N were more pronounced on the chlorophyll content than those of high v. low K. With few exceptions, the titratable acidity values reported as citric acid were greater in the high- than in the low-K cultures. Ascorbic acid values were greater in the low-K cultures of the nitrate-N series but smaller in the corresponding cultures of the NH₄-N series, showing that ascorbic acid was affected more by relations between nitrate v. ammonium N than by high v. low K. Total sugar values were greater in the low- than in the high-K cultures, indicating a low rate of polymerization of sugars to starch or other complex carbohydrates in the former cultures. Sucrose as percentage of total sugars was greater in the high- than in the low-K cultures and was more abundant in the chlorophyllose than in the non-chlorophyllose tissues of the leaves. Starch values were greater in the high- than in the low-K cultures, signifying a higher rate of synthesis in the former cultures—presumably from sugars. Starch

depositions were greatest in the transitional and low chlorophyllose sections of leaves and medial stem sections. Hemicelluloses and celluloses plus lignin were slightly higher in the low- than in the high-K cultures. These findings emphasize that adequate amounts of K in the nutrient solution and thus in plant tissues are essential for the condensation of reducing sugars to sucrose and starch. There are 48 references.

Selenium in soils, plants, and animals, S. F. TRELEASE (*Soil Sci.*, 60 (1945), No. 2, pp. 125-131).—Se is reported as the only mineral element known to be absorbed by food and forage plants in sufficient amounts to render them lethal when consumed; though highly toxic to animals, it is tolerated by most plants. It accumulates in relatively large amounts in some species, and there is evidence that it may be beneficial to these plants and perhaps essential to their development. This review (29 references) considers the distribution of Se in soils and their Se-supplying power, the Se-accumulating power of plants, Se converters, the form and distribution of Se in the plant, and Se poisoning in animals. For more comprehensive treatment of the Se problem and citations of the literature, the reader is referred to a number of other reviews.

Silicon in plant growth, G. J. RALEIGH. (Cornell Univ.). (*Soil Sci.*, 60 (1945), No. 2, pp. 133-135).—The author concludes from this brief review (5 references) and discussion that the case for the need of Si in plant growth seems strong, especially in view of the fact that in experiments reported to date its exclusion has undoubtedly not been so complete as in most work with other elements.

Sodium as a crop nutrient, P. M. HARMER and E. J. BENNE. (Mich. Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 2, pp. 137-148, illus. 3).—A survey (14 references) is presented of investigations made in Europe and America regarding the effects of Na on plant growth and the possibility of its serving as an essential plant nutrient. All crops studied may be placed in one of two classes, each of which may be further subdivided into two tentative groups with respect to their response to Na; the two main groups are those benefited by Na under K deficiency and those benefited by Na under K sufficiency. Na appears to have no special function in crops which are benefited only under K deficiency, evidently merely assisting in the functions of K; on the other hand, Na seems to have definite functions which it can best fulfill in those which are benefited by an ample supply of K, as is evident in improved vigor and leaf color coupled with a longer growing period, increased disease resistance, and less wilting in hot dry weather. The absence of Na in the substrate of Na-responsive crops apparently results in an increased absorption of K to fulfill in part the functions of Na; in the absence of K, Na is unable to take over some of the important functions of K and thus a physiological break-down occurs. The Na content of highly responsive crops is greatly increased with ample Na, whereas the content of K is considerably decreased and that of Mg and Ca only slightly so. The total milliequivalent content of the four bases K, Na, Ca, and Mg remains fairly uniform whether or not Na is supplied. In the proper fertilization of the crops listed in the group benefited by Na under sufficient K, attention should be given to supplying an adequate amount of Na as a salt, of mine-run potash containing Na, or of NaNO_3 if the crops require the N. With further purification of the K fertilizers, it is deemed probable that the Na requirement of plants having only slight or medium benefit from Na under K deficiency must be considered for soils very low in available Na.

Zinc as a nutrient in plant growth, A. F. CAMP. (Univ. Fla.). (*Soil Sci.*, 60 (1945), No. 2, pp. 157-164).—The author concludes from this review (24 references) that the role of Zn is not yet understood; in the absence of other information it may be postulated that it is necessary for chlorophyll formation and growth. The presence of Zn within the plant appears fairly well established; this would tend to eliminate the possibility of indirect action in the soil as the basis for correcting Zn de-

ficiencies. Its availability varies with the pH, being lower with rise in pH and with the critical point between 5.5 and 6.5. Zn deficiency in many acid soils appears due to the cropping out of that naturally available or accumulated by native plants and to failure to replace it by proper cover cropping or fertilizing. In some acid soils its availability may be reduced through combinations with organic compounds. Reductions in the use of organic fertilizers and the replacement of many native covers with those of low Zn requirements plus indiscriminate liming will, it is believed, result in greatly increased Zn deficiency in the crop plants of the future.

The effect of anaerobiosis on adaptation to galactose fermentation by yeast cells, S. SPIEGELMAN (*Jour. Cell. and Compar. Physiol.*, 25 (1945), No. 2, pp. 121-131, illus. 2).—In an investigation of the effect of anaerobiosis on galactozymase formation by yeasts, two of the five strains tested were found unable to initiate the adaptation anaerobically although they could proceed under this condition provided a sufficiently long aerobic incubation had preceded. In the three strains giving positive results the rate of adaptation was, however, markedly slower than that attained aerobically.

Production of extracellular starch in cultures of capsulated yeasts, M. ASCHNER, J. MAGER, and J. LEIBOWITZ (*Nature [London]*, 156 (1945), No. 3958, p. 295).—*Torulopsis rotundata* and *T. neoformans* produced extracellular amylose; 25 different yeast strains belonging to various other taxonomic groups under the same conditions produced none. The amylose was formed only in a medium favoring growth and maintaining during growth a reaction below pH 5.

The laboratory-scale production of itaconic acid by *Aspergillus terreus*, A. J. MOYER and R. D. COGHILL (U. S. D. A.). (*Arch. Biochem.*, 7 (1945), No. 1, pp. 167-183).—A strain of *A. terreus* (NRRL 265) was found which readily fermented glucose to itaconic acid when grown on the surface of shallow layers of a liquid medium. A near optimum composition of this medium proved to be glucose, 250 gm.; $MgSO_4 \cdot 7H_2O$, 0.250 gm.; KCl, 0.050 gm.; NH_4NO_3 , 2 gm.; $ZnSO_4 \cdot 7H_2O$, 0.044 gm.; corn steep liquor, 4 cc.; $N/2$ HNO_3 , 50 cc.; and distilled water to make 1 l. Under optimum conditions 28 to 29 gm. of itaconic acid were produced per 100 gm. glucose consumed, in 10 to 12 days; 90 percent of that present in the fermentation liquor has been recovered as crystals sufficiently pure for industrial use.

Nitrogen absorption of ringed orange trees in sand culture, J. R. FURR, P. C. REECE, and G. HRNCIAR (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 51-54).—It is apparent from the experiments reported that ringing which allows rapid healing or bridging of the ring by wound tissue reduces N absorption for only a short time. After trees were ringed by a single knife cut, the absorption rate appeared normal within 2 weeks; when so done as to prevent wound repair, a reduction in absorption was noted during the first 5 days and the decline continued or remained at a low level throughout the tests (6 to 8 weeks). It seems likely that a number of factors enter into the effect of ringing on N absorption, among them the important effect of the metabolic state or activity of the root cells, the salt content, and the amount of carbohydrate available for respiration and other metabolic activities in the roots. It may be supposed that absorption in the ringed trees was reduced as a result of at least the prevention of downward movement of carbohydrates and growth substances past the ring, the depletion or exhaustion of reserve carbohydrates and possibly growth substances in the roots, the accumulation of N compounds below the ring, and the reduction in growth and metabolic activity of the roots from shortages in elaborated food and growth substances.

Accumulation of rubber by kok-saghyz at different periods of its life, A. A. DROBKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 47 (1945), No. 5, pp. 363-365).—Rubber is said to be present in a mobile form and evidently serving as a readily assimilated nutrient at critical periods of growth. The plant is highest in

rubber content by the second spring, when the rosette is fully developed. Plantations developing normally during the first season should thus be harvested in the spring of the second year; when under-developed the first year or when needed for seed, the 2-year-old roots may be left until the end of July. The increase in rubber content of the roots toward the beginning of winter is explained on the basis of a partial conversion of the carbohydrates into rubber, owing to the action of freezing temperatures in the soil; these studies have indicated a sharp drop in carbohydrates at this time.

The importance of oxygen in the nutrient substrate for plants—relation of the nitrate to respiration. S. G. GILBERT and J. W. SHIVE. (N. J. Expt. Stas.). (*Soil Sci.*, 59 (1945), No. 6, pp. 453-460, illus. 2).—The rate of respiratory CO₂ produced by soybean, oats, and tomato roots grown in a basal solution adequately supplied with nitrate N (plus-N cultures) was always higher than in roots of corresponding cultures without N (minus-N cultures). Substitution of ammonium N for nitrate N in the nutrient also produced lower yields of respiratory CO₂ than corresponding cultures having nitrate N, the values approaching those obtained in minus-N cultures. The difference between the respiratory CO₂ produced by the plus-N and minus-N (extra CO₂) roots was maximum at lowest O₂ levels and followed very closely the curves of nitrate-ion absorption and nitrate reduction as influenced by a wide range of O₂ levels in the nutrient medium. Production of the extra CO₂ appeared directly associated with the evolution of O₂ in nitrate reduction and its utilization in the respiratory processes.

Flower initiation and development in the orchid *Cattleya pinole*. E. JOHNSON and A. LAURIE. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), p. 388).—An abstract.

Histological observations on the location of pigments in the akene wall of the sunflower (*Helianthus annuus* L.) E. D. PUTT (*Sci. Agr.*, 25 (1944), No. 4, pp. 185-188, illus. 7).—These histological studies of the wall of sunflower ovaries and fruits at stages ranging from before flowering up to maturity were undertaken to determine the origin of pigments in relation to the development of the ovary wall and their location in the mature fruit.

GENETICS

An intergeneric hybrid between barley and *Elymus*, F. K. BAKHTEEV and E. M. DAREVSKAYA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 47 (1945), No. 4, p. 300).

Inheritance of resistance to bunt (*Tilletia caries*) in hybrids with Turkey wheat selections C. I. 10015 and 10016, A. A. EL KHISHEN and F. N. BRIGGS. (Calif. Expt. Sta.) (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 9, pp. 403-413, illus. 2).—Turkey 10016, a resistant selection, was found to have the Turkey and Rio genes for resistance to bunt (race T-1), and also a weak gene (*X*) which allowed about 25 percent of bunt when homozygous as contrasted with almost complete resistance with either the Turkey or Rio genes. Turkey 10015, a second resistant, was found to have *X* in common with Turkey 10016. The type of segregation encountered was explained best on the basis of an additional weak gene *Y* which permitted about 45 percent of bunt when homozygous. The two pairs of weak genes acting together confer a high degree of resistance almost equaling that of Turkey or Rio.

A cross between *Lycopersicon esculentum* and disease-resistant *L. peruvianum*, W. S. PORTE and H. B. WALKER. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 11, pp. 931-933, illus. 1).—A foliage disease-resistant selection of *L. peruvianum* was crossed on the tomato variety Prince Borghese—a red fruited paste tomato. The resulting hybrid proved intermediate in phenotype and exhibited marked heterosis, but was completely self-sterile. In open field culture it fruited

sparingly, but a number of outcrosses involving several tomato variety combinations have been fruitful.

Fasciation in horticultural plants with special reference to the tomato, Q. ZIELINSKI (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 263-268).—It seems apparent from this preliminary study and review of the literature (13 references) that in most commercial varieties of tomatoes the fasciation expressed in the blossom, fruit, and peduncle is primarily of genetic origin. Since the tomato is normally almost entirely self-pollinated, there is high probability that most varieties will be relatively homogeneous in genotype, in which case selection for smooth-fruited types within a variety is likely to be limited in effectiveness. This study has also demonstrated the importance of environmental factors, superimposed on the genetic basis, as modifying the expression of fasciation characters to a greater or less degree, depending on the genotype of the variety considered. It is pointed out that significant differences in locule number among varieties have been established; these must have a genetic basis. The most promising program for obtaining smooth-fruited tomato varieties would thus seem to be one of selection within the F_2 progenies of known crosses or use of the infrequent chance mutations.

Production of variable aneuploid numbers of chromosomes within the root tips of Paphiopedilum wardii, R. E. DUNCAN. (Univ. Wis.) (*Amer. Jour. Bot.*, 32 (1945), No. 8, pp. 506-509, illus. 6).—Various aneuploid complements of chromosomes are present in isolated cells of the root tips of *P. wardii*, one of the mottled-leaved Burmese ladyslipper orchids. Of the 20 types of chromosomes making up the idiogram, 3 may be present in an equatorial plate in numbers ranging from 3 to 6; this replication at trisomic to hexasomic level occurs through a process closely resembling that responsible for polysomaty except that not all chromosomes are replicated. The name aneusomaty is suggested for this phenomenon.

The cytological analysis of species hybrids, II, G. L. STEBBINS, JR. (Univ. Calif.). (*Bot. Rev.*, 11 (1945), No. 9, pp. 463-486).—This critical review (167 references) supplements one of the same title by K. Sax;^{*} the present author considers the factors involved in chromosome pairing, fertile species hybrids, species hybrids with slight irregularities of meiosis, structural hybridity and its effects, hybrids with very irregular meiosis, and the origin of hybrid sterility.

Differences in lengths of gestation periods of breeds of beef cattle, swine, and sheep, L. E. JOHNSON. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 24 (1944), pp. 27-32).—The gestation periods of three breeds of cattle, five breeds of swine, and four breeds of sheep born in the college animal husbandry flocks were tabulated.

The fecal excretion of estrogens by pregnant cows, L. LEVIN (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 407-411).—During the last 2 weeks of pregnancy, cows were found to excrete 5,000 to 10,000 rat units of estrogenic substance per kilo of dry feces. Calculated as α -estradiol, this amounts to 0.9 to 1.4 mg. of estradiol per kilo of fecal solids.

The fact that the major proportion (73 to 96 percent) of the estrogenic activity is found in the weakly phenolic, nonketonic fraction of the extracts strongly indicates that the active substance is estradiol. Likewise, the ratio of the weight of the rat unit to that of the mouse unit is in good agreement with the similar ratio obtained with pure α -estradiol, but not with that obtained with estrone or estriol.

The etiology and inheritance of inequalities in the jaws of sheep, J. E. NORDBY, C. E. TERRILL, L. N. HAZEL, and J. A. STOEHR. (U. S. D. A.). (*Anat. Rec.*, 92 (1945), No. 3, pp. 235-254, illus. 9).—Studies of inequalities of the jaws of sheep^{*} have been conducted for more than 7 yr. at the Western Sheep Breeding Laboratory and U. S. Sheep Experiment Station at Dubois, Idaho. Instruments were developed for measuring the length and angles observed. There was a tendency for the angle

^{*} *Bot. Rev.*, 1 (1935), No. 3, pp. 100-117.

of the incisor teeth to compensate for this condition. Marked inequalities of the two jaws occurred in about 1.4 percent of the offspring from a large flock of normal Rambouillet sheep. In experimental matings in which one or both parents have over-shot jaws, 16.4 percent of the offspring were defective. Although the defective progeny were slightly smaller than normals, there was no decrease in viability to weaning. As overshot progeny occurred among normal parents, the condition appeared to be recessive. However, this hypothesis was refuted when matings of defective parents produced too few defective offspring. Further, when defective rams were mated with normal and over-shot daughters the abnormalities decreased in the progeny with the relationship between the sires and the dams, thus furnishing another reason against this theory. Interaction of several pairs of genes, some dominant and some recessive, could have been involved.

Variation in efficiency of hogs, L. A. WEAVER and R. BOGART (*Missouri Sta. Cir.* 290 (1944), pp. 11, illus. 6).—Comparison was made of three inbred lines of swine developed at the station. Line 1 was established from the college herd and averaged 210 lb. at 6 mo. and required 345 lb. of feed per 100 lb. of gain from weaning to market weight. Line 2 was established by combining thick, easy feeding stock with moderately rangy stock. This line averaged 215 lb. at 6 mo. of age and required 342 lb. of feed per 100 lb. of gain from weaning to market weight. Line 3 was established from a foundation stock having a favorable reputation for farrowing and raising large litters. This group averaged 194 lb. at 6 mo. and required 371 lb. of feed per 100 lb. of gain from weaning to market. In line crosses the average weights at 6 mo. and feed required per 100 lb. gain were, respectively, line 1 \times 2, 215 and 359 lb.; 1 \times 3, 195 and 385 lb.; and 2 \times 3, 222 and 376 lb. In cross breeding with Hampshire sows the average weights and feed required per 100 lb. of gain from weaning to market weight for the hybrid progeny were, respectively, line 1, 255 and 390 lb.; line 2, 256 and 420 lb.; and line 3, 202 and 423 lb. The pigs were all self fed on pasture or in dry lot.

Inheritance of coat color in swine.—IV, Analysis of hybrids of Landrace and Large Black, H. O. HETZER (U. S. D. A.). (*Jour. Hered.*, 36 (1945), No. 10, pp. 308–312, illus. 1).—In crosses between Large Black and Landrace swine, it was shown that the solid black color of the Large Black depends on gene *E* for extension of black, a dominant allele of the black spotting gene *E^p* possessed by the Landrace. In matings of Large Black boars to Landrace sows there were produced 90 *F*₁ pigs which were white or white with varying numbers of black skin spots on the back, neck, face, and ears. The hairs of these spots were white, but some of the spots had an intermixture of black and white hairs, giving a bluish appearance. Some *F*₁s had longitudinal stripes. Pigs showing black color in the skin had larger spots on the whole than the *F*₁ of the Landrace \times Poland China and Landrace \times Berkshire crosses previously noted in this series (*E. S. R.*, 94, p. 48). The Large Black seemed to have a more effective factor complex for density of black than the Poland China or Berkshire. Seven *F*₁ sows mated with 2 *F*₁ boars produced 84 *F*₂ pigs of which 57 were white, 21 black and 6 black spotted, giving good agreement with a modified dihybrid ratio of 12 : 3 : 1, suggesting that the white of Landrace depends on a single dominant gene (*I*) epistatic to both solid black (*E*) and black spotting (*E^p*), that solid black is dominant over black spotting, and that these two genes are inherited independently of each other, further proving that there is good reason for assigning the formula *E^p E^p I I* to the Landrace, *E E i i* to the Large Black, and *E^p E^p i i* to black-spotted animals. Perfect agreement with expectation of equal numbers of black and white pigs occurred in the backcross progeny of *F*₁ boars mated to Large Black sows, but there was a considerable deficiency of whites in the reciprocal cross, although the sexes were in equal numbers. The ratio was 18 whites : 35 blacks, giving a *P* value of less than 0.02 by the χ^2 test. Obviously it

cannot be attributed to linkage since the two classes should conform to a 1 : 1 ratio. A total of 1,670 pigs was produced in addition to the F_1 , F_2 , and backcross generations. Solid black was dominant over black spotting. The appearance of sandy-and-black and red-and-black spotted pigs in addition to white-and-black spotted pigs in some segregating generations is explained on the assumption that the Large Black has red intensity factors lacking in whole or in part in the Landrace.

Contributions in mouse genetics (*Jour. Hered.*, 36 (1945), No. 9, pp. 257-288, illus. 13).—These contributions, byproducts of studies on the inheritance of cancer and its resistance in mice, are presented from the Roscoe B. Jackson Memorial Laboratory at Bar Harbor, Maine.

The varitint-waddler mouse: A dominant mutation in *Mus musculus*, A. M. Cloudman and L. E. Bunker, Jr. (pp. 258-263).—A new coat-color varitint-waddler, altering the character of the pigment, was observed in hybrids between C57 black and C57 brown stocks of mice. The gene modification is expressed by modifiers of three types, (1) many areas without pigmentation, (2) large fields with partial and progressive suppression or dilution of color, and (3) islands of unchanging coat pigmentation that are of the same color and intensity found in self siblings. The coat-color modifications are associated with a choreic action. A single gene (*Va*), behaving as a dominant, seems responsible for both conditions. In 93 litters of 665 young produced by crosses of varitint-waddler parents with self types of self parents, there were 325 *VaVa* progeny and 340 self *vava* mice. There was a high differential mortality in *VaVa* mice, but no anemia was shown in the *VaVa* and *Vava* individuals. Other matings showed that *Va* was not an allel of the piebald gene. It was also shown that *Va* was not an allel of the dominant spotting genes *W* or *W^s*, and there was no evidence of linkage between varitint-waddler and dominant spotting.

A unique "Himalayan" mouse, M. M. Dickie (pp. 264-265).—The progression of color changes in the Himalayan mouse is diagramed.

Belted, a new sixth chromosome mutation in the mouse, J. M. Murray and G. D. Snell. (Univ. Maine et al.). (pp. 266-268).—A sixth chromosome recessive spotting gene, "belted" (*bt*), was found in the house mouse. It was characterized by dorsal and ventral white areas or sometimes by a white band encircling the body, usually slightly posterior to the mid-trunk region. There is commonly more dorsal than ventral white. The banded gene was linked with *caracul* (11.5 percent crossing over) and *naked*, in the order *bt-Ca-N*. The distribution of ventral and dorsal white in 134 individuals is tabulated.

Misty dilution in the mouse, G. W. Woolley (pp. 269-270).—An exceptionally light-colored ♂ mouse was found in the twenty-fifth generation of brother-sister inbreeding in a dilute brown strain. This gene was designated as misty (*m*) and linked to brown with a crossing over of 7.2 percent between misty and brown in 626 mice produced by *MmBb* × *mmbb* parents. All but 1 of 53 *ddmmbbaa* mice classified had white tails. Misty was associated with a white tail tip and white belly spot on certain genetic backgrounds.

A chromosome map of the mouse (pp. 271, 272-273).—The illustrations in this map show that of the 57 known genes in the mouse, 29 were found in 10 of the 20 pairs of chromosomes. None are sex-linked.

The detection of mutations: Relative efficiency of various systems of brother-sister inbreeding of mice, G. D. Snell (pp. 275-278).—The detection of excessive mutations by five systems of brother × sister inbreeding was compared. The systems differ in the number of breeding ♀♀ per ♂, whether or not pregnant ♀♀ are isolated, and the degree to which sublines are retained. Theoretically, the least efficient system is the use of four ♀♀ with each ♂. Pregnant ♀♀ are isolated, and the sublines are rapidly eliminated. The numbers of recessive mutations per

pen per generation can be increased four times as fast if there is one ♀ per ♂, pregnant ♀♀ are not isolated, and all sublines are retained. The number of recessive mutations discovered should be increased materially, perhaps doubled, by the more widespread adoption of methods of breeding approximating this system. Reasons are given for its use, and the necessity for maintaining minimum numbers. A general formula for the detection of rare mutations, developed by S. Wright, is given.

Linkage of jittery and waltzing in the mouse, G. D. Snell (pp. 279-280).—The gene for "jittery" in mice, described by K. B. DeOme, was shown to be linked with waltzing, with 26.2 percent crossing over in the F_2 and 15.3 percent in the backcross. These results were based on 125 F_2 and 59 backcross progeny.

Pirouetting mice, G. W. Woolley and M. M. Dickie (pp. 281-284).—Behavior patterns in the mouse which are inherited as Mendelian characters are Japanese waltzer, shaker-1, shaker-2, jerker, shaker-short, jittery, fidget, and Bochum waltzer. This study was undertaken to determine if the character termed "pirouette" is a new mutation in the mouse and if so to ascertain its method of inheritance. The character is also described as to its usefulness for further genetic, physiological, and anatomical studies. Pirouette mice showed pronounced derangement of behavior and in some ways was similar to the behavior exhibited by mice homozygous for *v*, *sh-1*, *sh-2*, *fi*, *dv*, and *je*. Pirouette seems due to a recessive gene with the symbol *pi*, and it was not identical to the other pattern characters. Rotation of *pipi* mice on a cyclostat failed to produce symptoms of dizziness. There was no evidence of sound response nor were *pipi* mice able to swim with coordination on the surface of the water.

Abnormalities of the mammae in the house mouse, C. C. Little and H. McDonald (pp. 285-288).—Records were made of abnormal numbers and degree of development of mammae in several inbred strains of *Mus musculus* and their hybrids. The normal mammary pattern in mice consists of five pairs of mammae, three in the thoracic region and two in the inguinal region. The supernumerary glands were usually one or more on either side. There was no regularity in deficiencies, although deficiencies in different stocks were characteristic. There was little if any evidence of transmission of the defect from mother to daughter.

Sirens, aprosopi, and intestinal abnormalities in the house mouse, S. GLUECKSOHN-SCHOENHEIMER and L. C. DUNN (*Anat. Rec.*, 92 (1945), No. 3, pp. 201-213, illus. 3).—Descriptions are given of three groups of monsters observed among the offspring of mice carrying mutations at or near the *T*-locus. These consist of one group with sirenioid malformations, a second with severe head abnormalities, and a third group of monsters with severe intestinal atresiae.

Hormonal induction of mating responses in a rat with congenital absence of gonadal tissue, F. A. BEACH (*Amer. Nat.*, 92 (1945), No. 3, pp. 289-292).—A ♀ rat with congenital absence of gonadal tissue and uterine horns was found to display normal ♀ mating behavior when placed with a vigorous ♂ 48 hr. after intramuscular injection of 500 rat units of estradiol benzoate and 0.5 mg. of progesterone.

A study of the estrous cycle in the golden hamster, Cricetus (Mesocricetus) auratus Waterhouse, G. C. KENT, JR. and R. A. SMITH. (La. State Univ.). (*Anat. Rec.*, 92 (1945), No. 3, pp. 263-271, illus. 6).—The average duration of 184 complete estrus cycles in 12 hamsters during an 8-mo. period was 3.9 days, as indicated by vaginal smears. The vaginal contents were observed during estrus, metestrus, diestrus, and proestrus, and descriptions of them are given. The period of estrus during which few or no leucocytes were present in the vaginal lumen, and when squamous cells were the typical cell type present, was found to occupy 27.4 hr.

Laying streak by inbred hen spotlights poultry breeding work, T. H. CANFIELD (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1945), No. 1, p. 14, illus. 1).—

In inbreeding studies with White Leghorn and New Hampshire breeds and crosses between them, a 2-year-old inbred White Leghorn hen which had produced 214 eggs in her pullet year laid eggs on 153 consecutive days.

A test of fowls bred for resistance to lymphomatosis, F. B. HUTT, R. K. COLE, and J. H. BRUCKNER. (Cornell Univ.). (*Poultry Sci.*, 24 (1945), No. 6, pp. 564-571, illus. 5).—In six generations of selection, seven strains of fowls were developed which differed significantly in egg production and resistance to neoplasms. Samples of 100 or more ♀ chicks of each of four good strains of White Leghorns bred for egg production were mixed with two lines bred for resistance to lymphomatosis and one line bred for susceptibility to disease. In four of the lines deaths from 42 to 500 days of age were considerably fewer than in four unselected stocks. Total mortality was 51 percent in one line and 50 percent in one unselected stock. Egg production and production indices were higher in two of the strains than in four of the other stocks. Deaths from neoplasms were from 2.3 to 9 times as frequent in one susceptible line as in two resistant stocks. It is concluded that strains were developed in six generations by selection for resistance to lymphomatosis. A highly susceptible strain was also established by selection in the other direction.

The effect of castration and sex hormones upon the incidence of lymphomatosis in chickens, B. R. BURMESTER and N. M. NELSON. (U. S. D. A.). (*Poultry Sci.*, 24 (1945), No. 6, pp. 509-515).—The effects of castration and implantation of diethylstilbestrol and testosterone propionate on the incidence of lymphomatosis were investigated in 368 White Leghorn chicks of both sexes. The occurrence of lymphomatosis was found in birds that were noninoculated and in others that were inoculated by intravenous injections with blood from donors showing typical gross lesions. Castrated ♂♂ had a significantly higher incidence of this disease than normal ♂♂, whether or not they were inoculated. Although ovariectomized ♀♀ showed a higher incidence of the disease than normals, the difference was not significant. Capons treated with ♀ hormone had a significantly lower incidence of the disease than untreated capons, but no significant effect was demonstrated in normal ♂♂. Treatment with the ♂ hormone caused a significantly lower incidence of the disease in both ♂♂ and capons. These results probably account for the fact that the incidence of lymphomatosis is usually lower among ♂♂ than ♀♀.

The effect of thyroprotein on egg production, C. W. TURNER, H. L. KEMPSTER, N. M. HALL, and E. P. REINEKE. (Mo. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 6, pp. 522-533, illus. 3).—A group of twenty-four 2-year-old White Leghorn hens was fed for a full year a ration including 10 gm. of thyroprotein containing 2.7 percent thyroxine per 100 lb. of feed, whereas another group was given no thyroprotein with the feed. The experimental group received twice the amount of thyroxine necessary to prevent enlargement of the thyroids of 6-month-old chicks fed 0.1 percent thiouracil. The egg production followed closely that of the control group, but after May 7 this group gradually declined in egg production while those fed thyroprotein continued to lay at the winter level until August when egg production fell off precipitously. The control group fell off 43.8 percent in egg production during the second half of the year in comparison with only 6.4 percent for the birds receiving thyroprotein. The annual production in the first and second year was known for the treated and control hens. The third year's egg production for the control group was 81.3 percent and 89.5 percent of the first and second years' production, whereas those fed thyroprotein the third year produced 72.5 and 102.3 percent of these respective amounts. Experimental groups of 12 Rhode Island Red 2-year-old hens each were fed 10 and 20 gm. of thyroprotein per 100 lb. of feed. The controls decreased 25.6 percent in the fall and winter egg production, whereas those fed 10 gm. of thyroprotein declined only 6.1 percent. Egg production of those receiving 20 gm. of thyroprotein per 100 lb. of feed was below that of the control group. It

is concluded that the summer decline is due in part to a reduced secretion of thyroxine during the summer months. Egg production was maintained at a more uniform level when the thyroid hormone was fed.

Seasonal rhythm in the thyroid hormone secretion of the chick, E. P. REINEKE and C. W. TURNER. (Mo. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 6, pp. 499-504, *illus.* 1).—The thyroid hormone secretion of chicks at 2 weeks of age, measured by methods of Mixner et al. (E. S. R., 91, p. 672), showed seasonal changes. The maximum secretion levels equivalent to 2.45 γ daily in ♂♂ and 2.7 γ in ♀♀ were observed in the fall (October and November). The thyroid secretion declined thereafter to 1.95 γ in ♂♂ and 2.1 γ in ♀♀ in February and early March, and 0.75 γ and 0.9 γ in ♂♂ and ♀♀, respectively, during the latter part of March. The thyroid secretion remained at low levels until August. The level rose again during October to the normal winter level of the previous year. In the typical experiments conducted in the different seasons, one group of chicks received the standard ration only. Other groups received 0.1 percent thiouracil with 0.5 γ , 1 γ , 1.5 γ , 2 γ , or 3 γ of *d,l*-thyroxine. After 14 days the chicks were killed and sex determined, the thyroids weighed, and the thyroid hormone established by plotting the relation of thyroid weight to body weight.

Studies on pregastrular development, early embryonic development, and hatchability of prematurely laid eggs of the hen, P. D. STURKIE and A. G. WILLIAMS. (Ala. Polytech. Inst.). (*Poultry Sci.*, 24 (1945), No. 6, pp. 546-554, *illus.* 4).—This study was made to determine the effects of arrests of development of blastoderms (produced by obtaining eggs prematurely and cooling before incubation) upon the subsequent development and hatchability, with particular reference to the production of twins and abnormalities, and to the time after fertilization and the state of development reached by the blastoderm when such arrests made resumption of development impossible. Eggs from hens 13½ hr. after fertilization were cooled and subsequently incubated at control temperatures, but they failed to undergo early development. At this age the blastoderms were very susceptible to changes. When eggs were obtained 14½ hr. after fertilization and treated in this way, one-third of the embryos had undergone considerable development. Approximately 75 percent of such embryos incubated as soon as laid were alive or had developed to a considerable degree when examined. Early development was inhibited in less than one-third of the embryos when the eggs were cooled before setting 15½ hr. after fertilization. In eggs set as soon as laid, 80 percent were alive or had undergone appreciable development on observation. The percentage of eggs which hatched was low in those incubated 15½ and 19½ hr. after fertilization. Two cases of embryonic doubling attributed to the treatments are described. It was shown that in the 13½-hr. blastoderm the boundary between the central cells and the marginal cells is distinct, but in the 15-hr. blastula, cells from the central area have invaded the periblast and the latter has become organized.

What are good chickens? F. E. MUSSEHL ([*Nebraska Sta. Cir.*] 77-2 (1944), pp. [4], *illus.* 2).—General instructions on inheritance of egg laying and resistance to pullorum disease and leukosis are given. The principal points in poultry meat production are also itemized.

Lethal achondroplasia in the pigeon, W. F. HOLLANDER (*Jour. Hered.*, 36 (1945), No. 10, pp. 297-300, *illus.* 3).—One pair of White King pigeons purchased from a breeder in Austin, Tex., produced six embryos with unique abnormalities, but none of them hatched or even attempted to break the eggshell. All had short limbs. Dissection showed that both sexes were present among the lethals. No achondroplasia was observed in outcross young. A recessive autosomal gene was evidently responsible for the lethal condition. In addition to the factor (*s*) for white plumage, the original white genes were heterozygous for the color factor (*S*). No linkages

were found. The condition was superficially similar to the chondrodystrophic and micromelic types in chickens noted by Asmundson (E. S. R., 88, p. 613), Lamoreux (E. S. R., 88, p. 468), and Lyons and Insko (E. S. R., 78, p. 91).

A practical method of coloring semen for identification purposes, P. H. PHILLIPS. (Univ. Wis.). (*Jour. Dairy Sci.*, 28 (1945), No. 11, pp. 843-844).—In an attempt to find dyes which could be used for coloring stored semen samples without impairing the value of the semen for artificial insemination purposes, it was found that Nile blue sulfate, neutral red, and Sudan III, each in concentration to impart a distinct color to the sample, could be used satisfactorily. Janus green could be used over a limited period if necessary, while methylene blue, thionin, and alizarin sulfonate were not satisfactory.

FIELD CROPS

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), Nos. 9, pp. 1, 2, 7, 10, pp. 2, 8, illus. 4).—The progress of agronomic experiments are reported briefly in No. 9 in articles entitled: Defoliation of Late, Rank Growth Cotton With Dusting Grade Calcium Cyanamid, by P. W. Gull and J. E. Adams, (pp. 1, 7); Methods Listed for Establishing Kudzu by Vine Cuttings, by G. W. Johnston (p. 2); and Good Seedbed Preparation, Right Time of Seeding, Good Seed, Fertilization Essentials to Profitable Oat Yields, by P. W. Gull (p. 2). Articles in No. 10 include The Hormone Weed Killer, 2,4-D, by O. A. Leonard and F. H. Herzer (p. 2); and Fertilizers for Alfalfa Production, by C. D. Hoover and R. Coleman (p. 8).

Report of crop and pasture experiments at Lathrop in northwestern Missouri, 1940-1944, E. M. BROWN and C. A. HELM. (Coop. U. S. D. A.). (*Missouri Sta. Bul.* 486 (1945), pp. 19, illus. 5).—Two groups of experiments are reported.

I. *One year rotations of grain and Korean lespedeza for northwestern Missouri.*—The average annual production per acre of each of the double cropping systems compared on Sharpsburg silt loam was for winter barley for grain 15 bu. and lespedeza for hay 2 tons; oats for grain 36 bu. and lespedeza for pasture 68 lb. beef cattle gain (1940-42); wheat for grain 15 bu. and lespedeza 112 lb. cattle gain; and wheat and lespedeza, both pastured, 275 lb. cattle gain.

II. *The improvement of permanent pastures with legumes, phosphate, and limestone.*—Several methods of improving old bluegrass pastures were compared. Average annual live-weight gains per acre made by beef cattle on each of the different treatments 1940-44 were—for no treatment, 100 lb.; seeded to lespedeza (Korean) without soil treatment, 155 lb.; seeded to lespedeza 1940-42 and to sweetclover 1943-44, and limed and phosphated, 185 lb.; and seeded to sweetclover and limed and phosphated, 169 lb. Sweetclover established in the bluegrass sod resulted in a larger production of dry matter than establishment of a comparable stand of lespedeza, but the need for deferring grazing during most of May and all of June in reestablishing sweetclover prevented most efficient use of available forage during those years and reduced average annual cattle gains. Disking the dense bluegrass sod increased initial stands of lespedeza and sweetclover sown in old pastures. Under correct grazing management, no further tillage was needed to maintain an adequate stand of lespedeza in bluegrass, but some form of sod tillage might be required for reestablishment of sweetclover in bluegrass in alternate years. Presence of lespedeza or sweetclover in the bluegrass sod increased its productivity, increased the stand density of the bluegrass, and retarded invasion by weeds and weed grasses during a wet summer.

Irrigated pastures for forage production and soil conservation, J. G. HAMILTON, G. F. BROWN, H. E. TOWER, and W. COLLINS, JR. (*U. S. Dept. Agr.*,

Farmers' Bul. 1973 (1945), pp. 30+, illus. 12).—The merits of irrigated pastures in the farm economy are explained with information on the kinds of land suitable for this use, the main characteristics and management needs of 22 recommended pasture grasses and legumes, and the methods by which the pastures may best be established, irrigated, fertilized, and managed. The information presented applies to 17 Western States. Specific advice on the selection and management of pasture plant species is given for each of 5 areas into which the West is divided on the basis of climate.

Some conditions and influences pertaining to the native forage crop of the northern mixed prairie, B. W. ALLRED. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 11, pp. 876–887, illus. 4).—The mixed prairie, which supports nearly one-fourth of the livestock in the United States west of the 98th meridian, is composed of climax midgrasses, short grasses, and dryland sedges, plus a variety of subdominant nongrassy herbs, according to grazing inventories since 1936 on 17 million acres in conservation districts, demonstration projects, and reservations. Grasses and other vegetation have been modified throughout the ages as environment has been changed by shifting climates. Cool season midgrasses and palatable nongrassy herbs are the first plants to go out under heavy grazing and drought. Drought-resistant summer-growing short grasses, dryland sedges, Sandberg bluegrass, and unpalatable nongrassy herbs increase during the first stages in the depletion of excellent mixed prairie grasslands. Annual grasses and weeds increasing on depleted mixed prairie ranges include lambsquarters, Russian-thistle, woolly Indianwheat, sunflower, peppergrass, sixweeks fescue, witches'-broom, Japanese chess, cheatgrass brome, little barley, and false buffalo.

Pastures for Florida, R. E. BLASER, W. E. STOKES, J. D. WARNER, G. E. RITCHEY, and G. B. KILLINGER. (Coop. U. S. D. A.). (*Florida Sta. Bul.* 409 (1945), pp. 73+, illus. 45).—Practical information on the development, management, and evaluation of pastures in Florida is summarized from observations and from research findings (E. S. R., 80, p. 186; 84, p. 613; 88, pp. 232, 329, 759; 89, pp. 60, 437; 90, pp. 179, 616; 92, p. 785). Particular attention is given to native pastures; value of improved permanent pastures and their establishment by water control and fencing, destruction of obnoxious vegetation, use of adapted plants, fertilization, and seedbed preparation and planting; and their management through fertilization of established pasture, weed control, grazing, and seed harvest; and temporary pastures. The characteristics, adaptations, and cultural needs, and utility of the grasses and legumes commonly grown for pastures are described briefly, and are also set forth in appended tables.

An evaluation of kraft and parchment paper bags for the control of pollination in grasses, W. KELLER. (U. S. D. A. coop. Utah Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 11, pp. 902–909).—Smooth brome grass (*Bromus inermis*) produced more selfed seeds in 1943 under bags of 35-lb. parchment paper than from 50-lb. bleached kraft, which in turn surpassed 43-lb. parchment or 40-lb. brown kraft. In 1944, 35-lb. parchment and 27-lb. parchment appeared to be of similar value. Seeds produced under 35-lb. parchment and 50-lb. bleached kraft were heavier than those from 40-lb. brown kraft and 43-lb. parchment. Weight of seeds and ability to germinate were related significantly. Measurements of penetration of light and air through the different papers and of evaporation of water from vials in the bags failed to reveal any characteristics which might account for the results.

Crop variety recommendations for Oregon (*Oregon Sta. Bul.* 426 (1945), pp. 7).—The varieties of wheat, oats, barley, corn, alfalfa, red clover, and pasture grasses and legumes shown by experiments and experience to be best for specific areas are indicated for the coast region, Willamette Valley, Columbia Basin and Blue Mountains, central Oregon (irrigated), and southern Oregon.

The water requirement of alfalfa, C. S. SCOTFIELD (*U. S. Dept. Agr. Cir. 735* (1945), pp. 11, illus. 2).—Under the climatic conditions at Riverside, Calif., the water requirement of alfalfa grown in uniform soil in large cans was 75 percent higher during late summer and fall than during spring and early summer. The crop yields from surface irrigation, when only 40 to 50 percent of the available soil water had been used, were 47 percent higher and from continuous subirrigation were 106 percent higher than with infrequent surface irrigation, i.e., when all available soil water had been used; but water requirement values were about the same, 794, 781, and 743, respectively. Fertilized plants yielded 14 and 33 percent more than the unfertilized in 1943 and 1944, but water requirement values were about the same for both treatments, for 1943, 802 and 792, and for 1944, 706 and 661. Analyses of crops of 1944 showed that the only significant difference in composition (P not determined) occurred with the Na and K. For unfertilized plants the mean Na content (equivalents per million of dry plant material) was 258 and the K was 441; and for fertilized plants 192 and 612, respectively.

Winter injury and longevity in unselected clones from four wilt-resistant varieties of alfalfa, F. R. JONES. (U. S. D. A. coop. Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 10, pp. 828-838).—Small clones of unselected plants of the Ladak, Hardistan, Orestan, and Ranger varieties of alfalfa were grown in a nursery 1940-44 with a cutting schedule and cultivation designed to favor longevity. Although no severe winter had occurred, from a quarter to a half of the clones died in these varieties, and about half of the survivors were in poor condition. Sources of injury to clones and diseases believed responsible for death and deterioration are in the order of importance—progressive deterioration following winter injury, bacterial wilt (*Cornebacterium insidiosum*), and downy mildew (*Peronospora trifolium*). Inasmuch as a few clones in each variety had not deteriorated it appears that their selection should furnish material from which longer-lived alfalfas might be developed.

Investigations with the castor-bean plant.—II, Rate-of-planting and date-of-planting tests, W. E. DOMINGO and D. M. CROOKS. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 10, pp. 812-820).—That the number of castorbean plants (E. S. R., 94, p. 188) per unit area is important in determining yield, and that with a given number of plants present varieties adapt themselves readily to various spacings and arrangements, was indicated in 35 rate-of-planting tests 1941-43. Considering yield and ease of hand harvest, the optimum number of plants per acre appears to be about 5,000, about one plant 30-in. apart in 40- or 42-in. rows. Spacings of 24 to 36 in. within rows may be used without affecting greatly either yield or ease of harvest. Similar yields also may be expected by using equivalent numbers of plants in checked rows. With average quality seed in a good seedbed, the desired number will be produced by seeding about 10 lb. of Conner, 8 of Doughty 11, and 7 lb. of Kentucky 38 per acre. In 10 tests with plantings from as early as March 25 at Beeville, Tex., to as late as June 30 at Columbia, Mo., highest yields were produced by the earliest plantings. It is not recommended, however, that planting be extremely early because of difficulty of seedbed preparation, danger of freezing weather, and germination problems in cold soil. The optimum planting date in most of the region of adaptation appears to be a few days ahead of corn planting time in the particular area.

Methods of evaluation of red clover strains grown alone and with timothy in small plots, J. H. TORRIE and J. L. ALLISON. (Univ. Wis. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 10, pp. 852-857).—For the range of material tested during the crop years of 1937-38, 1939-40, and 1942-43 and under conditions comparable to those at Madison, Wis., row or broadcast plats seeded to red clover without timothy appeared satisfactory in testing the yielding capacity of red clover strains in preliminary small plot trials.

1944 Arkansas corn yield tests, D. B. SHANK and C. K. McCLELLAND (*Arkansas Sta., Rpt. Ser. 1* (1945), pp. 22, illus. 1).—Acre yields, shelling and lodging percentages, and tip cover, and for some tests earworm damage are tabulated for corn hybrids and varieties grown in 1944, and average yields 1940-44 in tests at the station and substations; and yields and shelling percentages are reported from tests on farms outlying from the substations. Many hybrids have surpassed varieties in yielding ability in 1944 and over a period of years, but not all hybrids have been better than all varieties in yielding ability. A hybrid that is well adapted to one region of the State, as evidenced by its relative high yields in the tests in that area, may be unadapted to another region of the State and may be outyielded by several hybrids which are better adapted to the latter region. A high-yielding hybrid may have other faults, as poor husk protection or a tendency to root or stalk lodging, that make it undesirable.

The detasseling hazard of hybrid seed corn production, T. A. KIESSELBACH. (Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 10, pp. 806-811).—Yields in fields devoted to commercial hybrid seed corn production are subject to special hazards associated with detasseling of the female parent plants, particularly the loss of upper leaves, accelerated smut infection, and inadequate pollen supply. In a well replicated test in 1944 under conditions of ample pollen supply, removal of tassels accompanied by the loss of 0, 1, 2, or 3 upper leaves reduced the grain yield 2, 3.5, 5.9, and 13.6 percent, respectively. In a double crossing field where 60 percent of the detasseled plants became infected with top-smut (*Ustilago maydis*), the smutted plants yielded only 54 percent as much grain as did the healthy plants, and this reduced the yield of the female single-cross parent 22.9 bu. per acre, or 28 percent. Cutting off the stalk just below the smut gall at an early stage increased the grain yield of infected plants 43 percent. These experiments, together with a review of the literature, led to the conclusion that, as a general principle, detasseling does not affect grain yields materially unless it is accompanied by loss of leaves or is followed by a heavy infection with smut.

Isolating better foundation inbreds for use in corn hybrids, F. D. RICHEY, (U. S. D. A. and Tenn. Expt. Sta.). (*Genetics*, 30 (1945), No. 5, pp. 455-471, illus. 3).—Yields of S_3 and S_4 inbreds were shown to be better criteria of their value in hybrids than generally recognized. Re-analysis of Jenkins' data (E. S. R., 75, p. 322) indicated that changes in the rank of 12 families for combining value from S_2 - S_3 to S_3 - S_4 were associated with successful selections among S_4 progenies, and that discarding the poorer families on the basis of top-cross tests in S_3 and S_4 would have eliminated 3 families whose average combining value in S_3 - S_4 practically equalled that of the best families which would have been retained.

Essentials of a working hypothesis advanced on the operation of genes determining yield in corn are that genes determining quantitative characters lack dominance; that genes in the dominant-recessive category are concerned with vigor; that individual genes differ in effect; and that the frequency of a recessive in a population will be in inverse relation to its deleteriousness. Expectations under this hypothesis are explored, with the conclusions that test crosses are a good criterion of combining value at any stage in the program, as of that time, but are not good indicators of prospective combining value until fixation has reasonably been achieved. Selfed performance on a progeny basis is not a good criterion of ultimate combining value until selection has eliminated recessives of larger individual effects and lower frequencies. With effective selection against recessives of major effect and progress toward fixation, progeny performance of selfs and of crosses will tend to tell more nearly the same story. Selfed performance then will be satisfactory for selecting within families, while crossed performance will be more suitable for selecting among families.

A program based on these principles, outlined and designated as cumulative selection, is a single, integrated system comprising an initial period of visual selection for individual plants in desirable progenies, testing for combining value, crossing among the high combining families, and a second cycle of selection based on selfed progeny performance.

Influencia de la cantidad de semilla sembrada sobre algunos caracteres de la planta y el rendimiento en el cañamo [Effects of seeding rate on several plant characters and yield of hemp], B. PELIOWSKI K. ([Chile] *Agr. Téc.*, 5 (1945), No. 1, pp. 48-64, illus. 3; *Eng. abs.*, p. 63).—Differences between the seeding rates of 90, 150, 200, 250, and 300 kg. per hectare during 3 yr. with reference to technical length of the stalk, yield stalk and seed, and percentage and yield of fiber were not significant. Differences between rates of seeding were significant only with diameter of stalk and with number of internodes. It did not appear advantageous to plant more than 90 kg. of hempseed per hectare for the best quality of stalks and the greatest yield of fiber and seed.

Composition of peanut shells of filled and unfilled fruits as affected by fertilizer treatments, W. E. COLWELL, N. C. BRADY, and J. R. PILAND. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 10, pp. 792-805, illus. 6).—Peanut shells were analyzed to learn about the mechanism whereby nutrient supply influences kernel development (E. S. R., 93, p. 573; 94, p. 191). Clean shells of 2-cavity size fruit from plants grown in field experiments wherein there were widely different responses to various treatments were grouped as those containing 2, 1, and 0 developed kernels. Even though marked differences in effects of treatment on yield and fruit quality had been obtained, no effect of treatment was found on the N, K, and Mg contents of shells in any given kernel group. The 2-kernel shells, however, were considerably lower in these three constituents than were 0-kernel shells, while levels in the 1-kernel group were intermediate. In two experiments involving Virginia Bunch, N. C. Runner, Spanish 2B, and White Spanish, the same general effect of kernel filling on composition was noted for all varieties and there were no marked differences in the composition of shells. The Ca contents of shells in a given group, however, were increased markedly by addition of Ca to the soil, although there was no definite relationship between Ca content of shells and kernel development. A marked effect of Ca treatment was shown by analyses of a bulk sample of clean 2-cavity shells (all kernel groups combined) at one location. Contents of N, K, and Mg were decreased and the Ca content increased by additions of gypsum. Beneficial effects of Ca in producing a high proportion of 2-kernel fruit were deemed responsible for these differences.

Some factors affecting the yield and grade of Green Mountain potatoes in Rhode Island, A. E. RICH (*Rhode Island Sta. Bul.* 297 (1945), pp. 19).—Green Mountain potatoes were grown 1939-44 on Bridgehampton very fine sandy loam fertilized annually with a 1 ton of 5-10-10 per acre. Ammonium sulfate proved to be a slightly better N source than sodium nitrate when the acidifying effect of the former was corrected by liming. Potatoes planted April 25 and May 5, 15, and 25 produced yields and percentages of No. 1 size tubers in descending order. Size of set had more effect on yield than whether it was cut or whole. Small whole sets (about 1.75 oz.) produced more stalks per hill and a slightly higher percentage of small potatoes than did cut sets (1-1.25 oz.). The percentage of scabby potatoes was not correlated with soil reaction, but seemed to be influenced more directly by the quantity of lime applied. Although there was some correlation between precipitation and yields, other climatic factors evidently influence the yield. While temperature seemed to have no direct influence, temperature and rainfall probably influence yields indirectly through damage by insects and diseases. See also an earlier note (E. S. R., 89, p. 306).

Influence of commercial fertilizers on Idaho potatoes, H. W. E. LARSON and H. K. SCHULTZ (*Idaho Sta. Bul.* 265 (1945), pp. 15, illus. 5).—Effects of N, P, and K fertilizers applied singly or in combinations on yield and quality of potatoes grown in demonstration plats were studied 1935–44 in 18 counties of southern Idaho. Yield increases, highly significant statistically and economically, were obtained on irrigated desert soils from applications of 175 lb. (average) each of ammonium sulfate and treble superphosphate and their mixtures. NP plats outyielded the N and the P plats where either was applied separately. The difference between the NP response and NPK response was small and nonsignificant. P appeared to be the most important nutrient, although N also was important in production of high yields. No apparent response came from adding K to the NP combination. Greater responses to fertilizer were obtained on fields in nonlegume crops the previous year than those in legumes. In check plats potato yields after alfalfa or clover averaged significantly higher than those yields after a non-legume. The average percentage of U. S. No. 1 tubers was only slightly increased by fertilizers. The average increase of 3.3 percent in the NP group of demonstrations was the only one significant statistically. Average yield increase were large enough to result in a substantially greater quantity of U. S. No. 1 potatoes per acre for all treatments.

Hastening the sprouting of Netted Gem and White Rose potatoes by treatment with ethylene chlorhydrin vapor, R. C. BAINES, W. G. MARSHALL, and B. F. BRANSTETTER (*Calif. Dept. Agr. Bul.*, 34 (1945), No. 3, pp. 124–133, illus. 1).—In the large scale treatment of potatoes described, chlorohydrin stimulated growth and increased the stand of plants from 12 of 13 lots of tubers studied. One lot of White Rose tubers harvested 109 days before planting showed only a slight beneficial effect from treatment. Recently harvested Netted Gem and White Rose tubers absorbed more chlorohydrin than more mature tubers.

Better potatoes are on the way, F. A. KRANTZ (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1945), No. 1, pp. 6–7, illus. 3).—An account of the development of improved potato varieties with concise descriptions of the objectives, methods, and accomplishments of the station. New varieties introduced by the station include Warba, Red Warba, Mesaba, and Kasota. These are being followed by five selections of unusual promise.

Fiber content in relation to length and age of Sansevieria Thunb. leaves, J. C. CRANE and R. E. ALONSO. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 11, pp. 953–961, illus. 2).—Leaves of the same length and age, grown under practically identical environmental conditions, as studied at the Cuban Agricultural Experiment Station contained averages of 2.67, 2.16, and 1.53 percent of fiber for *S. guineensis*, *S. cylindrica*, and *S. zeylanica*, respectively. With an increase in length of leaf of *S. guineensis*, a progressive increase occurred in the fiber percentage accompanied by a decrease in the moisture percentage. Data, based on morphological development of the leaves, also showed a similar trend. A 7- to 8-year-old planting of *S. guineensis* yielded 3,210 lb. of dry, clean fiber per acre. Doubt existed, however, as to whether more than half of this amount would be produced annually on a commercial basis at the end of the fourth or fifth year.

Sesame: A list of references, M. K. SWINGLE (*U. S. Dept. Agr., Library List* 20 (1945), pp. 18).—The 216 references in this bibliography are listed alphabetically by authors together with a subject index.

Liberation of HCN in sorghum, C. J. FRANZKE and A. N. HUME. (S. Dak. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 10, pp. 848–851, illus. 2).—A selected strain of Dakota Amber sorgho, high in HCN (E. S. R., 93, p. 712), liberated HCN into the surrounding atmosphere during growth. Two other strains tested which liberated no HCN during growth did so while thawing after being frozen. Plants that died and had become air-dry no longer liberated HCN.

Soybeans in the postwar world (*Soybean Digest*, 5 (1945), No. 11, pp. 19-37, 43-50, 53, 58-61, 64, 69-70, 78, about 10 illus.).—Papers in this annual edition include Soybeans in the Postwar World, by E. F. Johnson (pp. 19-20, 31); Soybean Developments in Indiana, by C. B. Biddle (pp. 21-22); Western Iowa Pointers in Growing and Harvesting Soybeans, by F. Hawthorn (pp. 22-23); Soys in Cotton Country, by L. Reed (pp. 24, 64); Twenty-Nine Years With Soybeans in Ohio, by J. B. Park (pp. 25, 53) (Ohio State Univ.); Adjusting the Combine, by E. L. Barger (pp. 26-27) (Iowa State Col.); Soil Conservation in Soybean Production, by R. E. Uhland (pp. 28-30) (U. S. D. A.); Soybeans in Rotation, by F. C. Bauer (pp. 30-31), and Soybeans Need Lime, Phosphorous, Potash, by A. L. Lang (p. 32) (both Univ. Ill.); Do Soybeans Contribute to Clover Failure? by O. H. Sears (p. 33) (Ill. Expt. Sta.); Future of Vegetable Varieties, by W. J. Morse (pp. 34-35, 58) (U. S. D. A.); Margarine and the Future of Soybeans, by A. Brown (pp. 35, 78); Soy—China's Cinderella, by J. Arnold (pp. 36-37, 69); Research Developments in Soybeans at the Northern Regional Research Laboratory, by A. K. Smith and J. C. Cowan (pp. 43-44), and Southern Soybean Program of the U. S. Regional Soybean Laboratory, by P. R. Henson (pp. 47, 60) (both U. S. D. A.); Soybean Storage Studies—1944-45, by D. G. Carter and L. E. Holman (pp. 48, 70) (Ill. Sta., Ill. Nat. Hist. Survey, and U. S. D. A.); and Off-Colored Seeds in the Lincoln Soybean, by L. F. Williams (pp. 50, 61) (U. S. D. A.).

Release of new variety seed cane C. P. 36-105, E. W. BRANDES, W. G. TAGGART, and J. J. SHAFFER, JR. (U. S. D. A. coop. La. Expt. Sta. et al.). (*Sugar Bul.*, 23 (1945), No. 19, p. 169).—C.P. 36-105, a new sugarcane released for commercial planting in the fall of 1945, has compared favorably with Co. 281 and C.P. 34-120 in indicated yield of sugar per ton of cane in cooperative field tests during recent years, but has averaged somewhat below C.P. 34-120 in acre yield of cane. The new cane has shown very satisfactory stubbling qualities, including apparent resistance to stubble failure associated with prolonged standing of frozen cane. This variety might be widely used to good advantage for mid-season to late milling, although extensive utilization on muck areas of the southeastern parishes and in the Red River section generally cannot yet be recommended. It is resistant to red rot and root rot, but has shown low percentages of mosaic and of chlorotic streak. Stalks of C.P. 36-105 approximate those of Co. 290 in diameter and are somewhat heavier than stalks of C.P. 34-120. Because of its relatively erect growth type and satisfactory resistance to lodging the variety should prove adaptable to mechanical harvesting. In fiber content and milling qualities, C.P. 36-105 is in a class with C.P. 29-320. Cane of C.P. 36-105 cut for the mill does not deteriorate too rapidly, but the variety is not considered suitable for windrowing. ♦

Identification of grain samples of hard red spring wheat varieties grown in western Canada, R. F. PETERSON, A. J. LEJEUNE, and H. C. LAIDLAW (*Sci. Agr.*, 25 (1945), No. 11, pp. 711-717, illus. 1).—A rapid visual method involving a minimum of measurement or statistical work is provided for identifying grain samples of the Marquis, Reward, Renown, Regent, Thatcher, Apex, Garnet, and Red Bobs, hard red spring wheat varieties which commonly occur in western Canada.

Grading soft red winter wheat at country points (*U. S. Dept. Agr.*, 1945, AIS-33, pp. [8], illus. 15).—Tests for odor, presence of insects, garlic, smut, dockage, other foreign material, test weight, moisture, damaged kernels, and wheats of other classes are outlined, together with grade requirements and concise directions on how to grow wheat that will grade high.

A seed dispenser—device for measuring seed by volume for rod row plots, C. H. GOULDEN (*Sci. Agr.*, 25 (1945), No. 11, pp. 707-710, illus. 2).

Nutgrass eradication studies.—IV, Use of chickens and geese in the control of nutgrass, *Cyperus rotundus* L., E. L. MAYTON, E. V. SMITH, and D. KING. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 10, pp. 785-791).—

Nutgrass (E. S. R., 88, p. 626) was eradicated by hens of the more active breeds, such as White Leghorns, from small ($\frac{1}{80}$ acre) pens, but the hens were ineffective in a larger ($\frac{1}{2}$ acre) pen. They had to be numerous enough to keep the nutgrass leaves eaten to the ground, and grazing was continued through two successive growing seasons. Geese were ineffective in eradicating nutgrass from uncropped land, but they practically eliminated the weed from $\frac{1}{2}$ -acre plats cropped during two successive growing seasons to cotton not cultivated after chopping and siding. The geese in the goose-cotton plats required a grain supplement after nutgrass became scarce. Sale of geese and cotton largely defrayed the expenses involved in the goose-cotton method.

HORTICULTURE

Horticultural organizations of the United States and Canada, N. W. SMALLWOOD (*U. S. Dept. Agr., Libr. List 16 (1945), pp. 32*).

Commercial horticultural organizations of the United States and Canada, N. W. SMALLWOOD (*U. S. Dept. Agr., Libr. List 17 (1945), pp. 14*).

Some factors influencing the reliability of plant tissue testing, J. F. HARRINGTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 313-317).—Although differences in the available nutrient supply could be measured by analyses of the extract of fresh plant tissue, the results were applicable to only one soil as differences in soil type masked the differences due to availability of any given element in the soil. There was a drift in concentration of an element as the plant matured, due apparently in large part to changes in nutrient balance. When an element was low, the concentration of its ion decreased as the plant matured, and when another or other elements were low the concentration of the ion increased as the plant matured. This drift might well be a more reliable guide to fertilizer needs than the absolute amount of an ion present in the tissue at any given testing date.

Apparently the conducting tissue, such as the petiole of the spinach and the stem of the bean, is a more reliable guide than other tissues since the magnitude of differences is greater and the response to a change in available nutrient supply is quicker in the conducting tissue. It is essential to sample the same morphological region or tissue when making comparisons, as the differences between tissues is usually greater than the differences between fertilizer treatments.

Analyses of materials sold as insecticides and fungicides during 1944, C. S. CATHCART and R. L. WILLIS (*New Jersey Stat. Insp. Ser. 16 (1944), pp. 12*).—In the customary manner (E. S. R., 92, p. 654) there are presented the results of analyses of materials collected during the 1944 inspection.

Breeding better vegetables for the South at the United States Regional Vegetable Breeding Laboratory, C. A. MAGOON ET AL. (*U. S. Dept. Agr., Misc. Pub. 578 (1945), pp. 34+*, about 10 illus.).—This publication describes the work of this Laboratory at Charleston, S. C., conducted by the Department under the Bankhead-Jones Act in cooperation with 13 southeastern State experiment stations. Outlined are the objectives of the laboratory, the vegetable crops under study, and the accomplishments attained since establishment of the laboratory in 1936. A list of its publications is appended.

Spacing affects yield of asparagus, H. C. THOMPSON ([*New York*] *Cornell Sta. Bul.* 822 (1945), pp. 8, illus. 1).—Conducted at Ithaca, N. Y., on a Dunkirk fine sandy loam of moderate fertility, the experiments showed that in general the yield of marketable spears of asparagus increased as the distance between plants in the row decreased, and the differences were significant. The difference in yield per acre between the two-row spacings, over the three spacings in the row, is not significant. However, at the 24-in. spacing in the row, the yield per acre was significantly higher from the rows 4 ft. apart than from those spaced 5 ft. apart.

The yield of Grade 1 spears followed, in general, the yield of total marketable spears. However, the difference in average yield per acre of Grade 1 spears between the 12- and 18-in. spacings in the row was small and probably not significant. There was no significant difference in yield per acre of Grade 1 spears between rows spaced 4 and 5 ft. apart.

The yield of total marketable and Grade 1 spears varied widely from year to year, owing to undetermined factors. There appeared to be no definite relation between yields and length of harvest season, temperature and rainfall during growing season, or length of growing season between the end of harvest and the first killing frost in the fall.

The average number of spears per plant increased as the spacing between plants in the row increased from 12 to 18 to 24 in. Also, the number of spears per plant increased as the distance between rows increased from 4 to 5 ft. for the 12- and 18-in. spacings in the row, but not for the 24-in. spacing in the row.

The average weight of spear was greater from rows spaced 5 ft. apart than from those spaced 4 ft. apart over each of three spacings in the row. The difference in average weight of spear between the 12-, and 18-, and 24-in. spacings in the row, over the two-row spacings, was small and not significant.

The results of this experiment seem to justify the conclusion that spacing asparagus plants more than 18 in. apart in the row is not advisable on soils of moderate fertility. Even closer spacing is likely to result in larger yields during the first 10 yr.

Varietal susceptibility in garden beet to boron deficiency, J. C. WALKER, J. P. JOLIVETTE, and W. W. HARE. (Univ. Wis.). (*Soil Sci.*, 59 (1945), No. 6, pp. 461-464).—Examinations of beet varieties grown in 1940 and 1941 in boron-deficient soil near Winneconne and Clyman, Wis., showed marked variation in susceptibility to internal black spot, a disorder caused by insufficient boron. The most susceptible varieties were Flat Egyptian, Light Red Crosby, Good For All, Morse Detroit, and one strain each of Early Wonder, Short Top Detroit, and Cannors Detroit. One strain of Early Blood Turnip had a low index in each trial, and Long Dark Blood was practically free of the disorder. In 1944 another trial was conducted at Winneconne, the more critical site. Good For All, Flat Egyptian, and Morse Detroit were again the most susceptible to injury. The desirability of beet breeders taking cognizance of boron deficiency susceptibility is stressed.

A succession of cabbage varieties for home gardens, T. E. ASHLEY (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 9, p. 6).—The results of a cabbage variety test at the South Mississippi Branch Station showed Golden Acre in the lead with an average production of 13,705 lb. per acre during the 2 yr. 1944 and 1945. Copenhagen Market and Marion Market were close competitors with averages of 13,057 and 13,037 lb. respectively. Golden Acre and Copenhagen Market ripened about 2 weeks earlier than Marion Market.

Results of 1945 sweet corn variety tests, J. L. BOWERS (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 9, pp. 1, 6, 8).—In a planting of seven hybrids from the Midwest, one field corn, and Golden Cross Bantam at the main station, Tristate and Aristogold Bantam No. 3 led with yields of 4,351 and 3,632 lb. of marketable ears per acre, respectively. The season was unfavorable due to prolonged dry periods. The field corn, Hickory King, proved most resistant to corn earworm.

Interaction of nitrogen nutrition and photoperiod as expressed in bulbing and flower-stalk development of onion, N. J. SCULLY, M. W. PARKER, and H. A. BORTHWICK. (U. S. D. A.). (*Bot. Gaz.*, 107 (1945), No. 1, pp. 52-61, illus. 3).—Onion plants grown on photoperiods substantially longer than that critical for bulb formation showed no difference in bulb development when supplied various amounts of nitrogen. Plants grown on a photoperiod at or near that critical for bulb formation exhibited the greatest bulb development with the lowest N concentration and

the least with the highest concentration. Onion plants of sister lines gave similar bulbing response on photoperiods of identical duration, but differed in their production and development of visible floral stalks, especially on the shorter photoperiods. Onion plants were grown from seed to seed without an intervening dormant bulb stage by controlling the photoperiod and concentration of N available for growth.

Effect of different cultural practices on the yield of tomatoes, J. L. BOWERS, (Miss. Farm Res. [Mississippi Sta], 8 (1945), No. 9, pp. 1, 8).—Of seven treatments compared for growing tomatoes, the most successful from the standpoint of total and early yield was spacing the plants 2 ft. apart in the row and rows 4 ft. apart, plants unpruned but staked. Pruning reduced total yields, but did not affect early yields to a significant degree. Staking is believed essential in order to prevent rotting of fruits.

The importance of environment for growing apples, M. A. BLAKE, L. J. EDGERSON, and O. W. DAVIDSON (New Jersey Stat. Cir. 498 (1945), pp. 24, illus. 15).—The basic external factors of environment—air, light, moisture, temperature, and nutrients—together with carbohydrates and associated compounds produced within the plant, are responsible for the growth and productiveness of apple trees. Adequate circulation of air about the trees and good aeration of the soil are necessary for best growth. Without adequate light, few fruits will form and these will lack color, sugar content, and firmness. Rainfall must be adequate and the soil of a nature and condition to absorb and hold sufficient moisture to produce a crop of fruit.

Apple trees function most efficiently at temperatures of 65° to 75° F. Varieties of apple differ in their reaction to environmental conditions, making it essential that the grower in selecting a site know varietal requirements. For example, in New Jersey varieties such as Baldwin and McIntosh, which prefer a cool growing season, thrive better in northern than in southern New Jersey. The ultimate results in growth and production are attained through the combined effect of both soil and climatic factors, as modified by culture on the varieties grown. A suggestion for classifying sites is offered.

Further studies on the effect of certain chemicals on the fruit set of the apple, G. W. SCHNEIDER and J. V. ENZIE. (N. Mex. Col. Agr.). (Amer. Soc. Hort. Sci. Proc., 45 (1944), pp. 63-68)—Presenting the results of additional work (E. S. R., 90, p. 191), the authors report that naphthaleneacetic acid showed considerable promise as a material to reduce set. Since strong concentrations of this acid caused a significant reduction in the number of flowering points formed for the following year on Arkansas Black, the acid may have value as an off-year spray to reduce flower bud formation for the on-year crop. Naphthaleneacetamide may have value as a spray to reduce set, since sprays of 0.008 percent concentration applied in the on-year reduced set without visible injury to the tree. Borax had apparent value, since concentrations of 0.5 and 1.0 percent reduced set without apparent injury.

Indoleacetic and indole butyric acids had no apparent value as sprays to increase the set of Arkansas Black, in the concentrations used in the trials.

Cherry rootstocks, F. M. COE (Utah Sta. Bul. 319 (1945), pp. 42+, illus. 10).—Records taken in a sweet cherry orchard established in 1931 on the Davis Experimental Farm near Farmington, Utah, showed the sweet cherry trees on mahaleb rootstocks to be much superior in vigor, size, hardiness, survival, and yield to trees of the same scion variety on mazzard roots. The mahaleb-rooted trees were larger, more productive after the ninth year, and better anchored in the soil than were the same varieties on Stockton Morello. The trees on morello began fruiting at an earlier age, ripened their fruits earlier in the season, but tended to overbear and lose vigor earlier than did the mahaleb-rooted trees. The morello-rooted trees were more subject to high temperature injury and to wind damage.

Based on the results of the investigation, observations, and growers' experiences elsewhere in Utah, mahaleb rootstocks are recommended for commercial use in the typically porous gravelly orchard soils of Utah. Stockton Morello may have limited use as a rootstock for home garden trees.

The author reviews the history and status of the cherry rootstock problem in Utah and the country at large. In other sections where the environmental conditions are different than in Utah, the mazzard has proved to be a better rootstock for the sweet cherry than has the mahaleb.

Precooling California grapes and their refrigeration in transit, W. T. PENTZER, C. E. ASBURY, and W. R. BARGER (*U. S. Dept. Agr., Tech. Bul. 899 (1945), pp. 64, illus. 29*).—The precooling of grapes became a general practice following the granting of a refrigeration service by the railroads in 1932 that provided for initial icing of refrigerator cars and one re-icing in transit, this replacing a method in which the bunkers were re-iced 10 or 12 times in transit and resulting in a net saving of about \$26 per car.

A comparison of various types of equipment used for precooling loaded cars of fruit has shown that high speed propeller fans placed inside the car at the bulkhead openings and directing air towards the center are more effective than fans placed inside the bunkers. A battery of four fans at the brace blowing downward, the load covered with canvas, cooled grapes as effectively as did bulkhead fans. Truck-mounted mechanically refrigerated units and truckside brine-refrigerated units required about as much time for thorough precooling as did bulkhead fans. None of the equipment tested cooled moderately warm fruit to what is regarded as fairly good transit temperatures, 40° to 45° F., in much less than 14 to 18 hr.

No justification could be found for heavy chopping of ice, but occasional chopping during precooling to fill large voids was necessary. Lugs loaded crosswise in the car cooled more slowly than when loaded lengthwise, the difference being greatest in the middle layers. A method for judging the effectiveness of precooling by taking temperatures in five accessible positions was suggested. When cars were cooled with ice, an average temperature reduction of 3.4° was obtained in 30,000-lb. loads for every 1,000 lb. of ice melted.

The transportation tests demonstrated that well-precooled cars re-iced once in transit had lower transit temperatures than nonprecooled loads re-iced ten times. Initial icing, without re-icing in transit, was adequate for cars precooled to 40° to 45°, replenished after precooling when shipped in cool weather. Crosswise loads had somewhat warmer middle layer temperatures in transit than lengthwise loads; top and bottom layers were similar.

Thorough precooling permitted heavy 34,000-lb. loads to be shipped with temperatures only 1° or 2° warmer in the top layer than 29,000-lb. loads. Refrigerator cars equipped with axle-driven fans eliminated the wide spread in temperature between top and bottom layers, and when thoroughly precooled temperatures close to 35° to 37° were maintained in transit throughout the load.

Boron content of citrus trees grown on various rootstocks, A. R. C. HAAS. (*Calif. Citrus Expt. Sta.*). (*Soil Sci.*, 59 (1945), No. 6, pp. 465-479, illus. 1).—Studies of the relation of rootstock variety to the accumulation of boron in the fruit, leaves, and bark of citrus trees growing under comparable soil, cultural, and climatic conditions showed that the boron content of the peel of Valencia oranges from trees on sweet and sour rootstocks was slightly less than where other rootstocks were used. Gradients occurred in the peel of Valencia orange and Eureka lemon fruits. Differences in the boron content of the outer and inner portions of the peel in orange and lemon fruits were greatest when the rootstock was sour orange.

The water-insoluble boron content of the dry matter of Valencia orange leaves of trees on the various rootstocks was remarkably uniform. Large differences were

found in the water-soluble and in the total boron content and these differences were definitely associated with the variety of rootstock. This relationship was shown also for the leaves of lemon, grapefruit, and navel orange scions when grown on various rootstocks. The effect of the rootstock on boron in the leaves was slightly greater for sweet than for sour orange rootstocks, and the effects were greater for lemon and grapefruit than for leaves of navel or Valencia orange scions.

Boron in the dry matter of citrus trunk bark appeared to be largely water insoluble, and the trunk bark did not, therefore, give as clear a picture of the boron situation within a tree as did the leaves.

Respiration of citrus fruits after harvest, M. H. HALLER, D. H. ROSE, J. M. LUTZ, and P. L. HARDING. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 8, pp. 327-359, illus. 10).—Determinations of the carbon dioxide evolved and the oxygen consumed by oranges, grapefruit, and lemons showed that the respiratory rates of all fruits increased greatly with increases in temperature. The temperature coefficients (Q_{10}) were highest between 32° and 50° F.; dropped to minima, averaging about 1.5 between 62° and 90°; and increased again above these temperatures, particularly in carbon dioxide output. At temperatures of 32°, 40°, and 50°, the respiratory rates remained fairly constant with time, whereas at the higher temperatures (70° to 110°) the rates decreased generally with time. Respiratory ratios did not differ significantly at the low and intermediate temperatures (32° to 80°) but increased markedly at the higher temperatures (90° to 110°), indicating intramolecular respiration.

The respiratory activity of oranges and lemons decreased with increased maturity, and the activity of oranges from trees on sour orange roots was higher than that of oranges from trees on rough lemon roots.

The heat of respiration of the different fruits, computed for the different temperatures, was found to average 11 to 96 percent higher when computed from carbon dioxide than when computed from oxygen determinations. It is believed that oxygen determinations represent the sounder basis for computing heat of respiration.

The addition of ethylene at the rates of 1 to 10 parts by volume to 10,000 parts of air increased greatly the respiratory activity of all three fruits. There was no difference between 1 and 10 parts of ethylene per 10,000 parts of air, but much weaker concentrations had no apparent effect. Daily additions of ethylene at the rate of 2 parts per 10,000 did not increase or maintain the respiratory activity more than the original addition of 2 parts per 10,000. The maximum respiratory activity was generally attained 2 to 3 days after the addition of ethylene; the activity then decreased and respiration returned to normal after aeration.

The respiratory activity of lemons infected with green mold (*Penicillium digitatum*) was increased as much as 12 times that of sound lemons.

The results indicated that respiratory activity occurs in both the flesh and rind of lemons approximately in proportion to their fresh weights.

The respiratory activity of grapefruit from trees sprayed with lead arsenate was lower than that of grapefruit from trees not so sprayed.

Methods of using winter legumes with tung trees, S. R. GREER (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 9, p. 6).—Tung trees when interplanted with winter legumes made greater growth and produced more nuts than did trees with summer legumes as an intercrop. An application of 500 lb. per acre of basic slag increased materially the production of winter legumes and incidentally the yield of nuts on the trees in the winter legume plots. An application of 500 lb. of basic slag produced almost as much tonnage of vetch as did 1,000 lb. of cal-phos. Winter legumes recommended for Mississippi tung orchards are wild winter peas, vetch, and Austrian winter peas. The wild winter pea is capable of effective reseeding.

FORESTRY

Farm woodlands should not be grazed, D. DEN UYL. (Ind. Expt. Sta.). (*Jour. Forestry*, 43 (1945), No. 10, pp. 729-732, illus. 2).—Based on some 15 years' study of the relationship of livestock grazing to the growth and welfare of farm woodlands in Indiana, results of which have appeared in part in Indiana Station Bulletins 391 and 431 (E. S. R., 71, pp. 783; 80, p. 348), the author presents evidence to show that grazing of farm woods is not profitable and results in the progressive deterioration and ultimate destruction of the stands.

Pulpwood in farm forest economy, W. C. HOPKINS (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 10, pp. 1, 8, illus. 1).—The demand for pulpwood during the war period was so great and urgent that the conservation practices were largely abandoned, with serious damage to the forests. Wise management of farm woodlands aims at a final saw timber cut with three intermediate cuts for pulpwood, poles, piling, crossties, and fuel wood. The farmer is advised to harvest and deliver pulpwood himself rather than to sell it on a stumpage basis, thus obtaining a greater percentage of the potential income of the operations.

Storage of tuliptree seed, R. R. PATON. (Ohio Expt. Sta.) (*Jour. Forestry*, 43 (1945), No. 10, pp. 764-765).—A large quantity of tuliptree seed collected in the autumn of 1941 was placed in a pit about 30 in. deep in such a manner that 2-in. layers of seed were alternated with just enough sand to cover completely the underlying seed. The top covering of sand was about 10 in. in depth, with its surface about 1 ft. from the ground level so that surface water could accumulate or that water could be applied in drought periods. The seed was used in all subsequent sowings at the Marietta State Nursery and in the fourth year showed as good viability as when stored. Seed was removed from the pit by taking a vertical section from top to bottom.

DISEASES OF PLANTS

Host index of Oklahoma plant diseases, D. A. PRESTON (*Oklahoma Sta. Tech. Bul.* 21 (1945), pp. 168).—This publication comprises a host index in which each plant is listed together with all the pathogens or causal agents known to occur in Oklahoma, an index of pathogens or causal agents each of which is followed by the hosts upon which it has been reported in the State, and an index to the common names of the hosts. The distribution of diseases, given by counties in the host index, merely indicates the known reports; in many cases the diseases of any given plant may actually have a more widespread distribution in the State than is shown by the reports at hand.

Diseases of field crops in Oklahoma, K. S. CHESTER, W. W. RAY, J. H. McLAUGHLIN, and D. E. HOFFMASTER (*Oklahoma Sta. Cir.* 119 (1945), pp. 23, illus. 1).—Diseases of wheat, oats, corn, barley, and cotton have been estimated as causing an annual average loss of 25 million dollars in Oklahoma; diseases of field legumes are also serious. The tables and discussion presented tell how to recognize the principal diseases of these crops and give brief instructions for preventing them.

Doenças bacterianas das plantas em Portugal.—I, "Pé negro" e "podridões úmidas [Bacterial diseases of plants in Portugal.—I, Black leg and soft rot], M. DE LOURDES D'OLIVEIRA (*Agron. Lusitana*, 5 (1943), No. 3, pp. 227-241; *Eng. abs.*, p. 240).—The bacterial strains from black leg of potatoes or from soft rots of various plants are described, representing the types observed, and the morphological and biochemical characters and host ranges are presented; the hosts other than potato were cabbage, turnip, celery, vegetable marrow, melon, and stems of broad-bean. In laboratory tests no relationship between the origin of a strain and its reactions was observed, fermentation of maltose by the black leg isolates being the

only consistent difference between them and the soft rot isolates. Of the two strains from potato black leg, one produced gas on all carbohydrates tested except maltose, and the other produced no gas; of the two strains from cabbage, one was a gas former and the other was not. Some of the strains exhibited a more marked host specialization than others. Two isolates—one from melon and the other from marrow—caused practically no infection on hosts outside the genus *Cucurbita*; on the other hand, strains from turnip and cabbage proved very active both on their original hosts and on most of the plants inoculated with them, including members of the Cucurbitaceae.

Cytoplasmic diseases and cancer, M. W. WOONS and H. G. DUBUY (*Science*, 102 (1945), No. 2658, pp. 591-593).—In this critical review (21 references) the authors present data from studies by themselves and others on which they erect a theory linking three groups of diseases, viz, viroses, variegational diseases, and cancer; this theory is based on the similarity of plants and animals at cellular and subcellular levels. The viroses are considered as infectious diseases caused by entities evolved from one-time normal cell components—the ribose nucleoprotein components of plastids and mitochondria. In the variegational diseases, recently produced pathogenic cytoplasmic particulates—the variegation-inducing plastids or chondriosomes—are concerned. In animals it might be expected that cancer-inducing viruses could be found at one end of a “cancer spectrum” and at the other end localized cancer-inducing mitochondria corresponding to the variegation-inducing plastids (mitochondria) in plants. Proof is already at hand of the occurrence in nature of cytoplasmic particulates that can become pathogenic and that can be connected with viruses by gradual steps in a “spectrum of variegation.” These plastid-induced variegations of plants give access to concrete facts which it is believed may well be applied to the solution of the cancer problem; the data from studies on cytoplasmic particulates in plants can thus offer leads for studies in the much more difficult field of animal cytoplasmic diseases.

Étude de quelques champignons parasites nouveaux ou peu connus en France [Study of some parasitic fungi new or little known in France], G. VIENNOT-BOURGIN (*Ann. École Natl. Agr. Grignon*, Ser. 3, 4 (1943-44), pp. 216-241, illus. 7).—Besides a number of fungi cited, the following are discussed in more detail: *Ascochyta piricola*, *Phyllactinia corylea*, *Microsphaera alphioides*, *Cercosporina tetragonae*, *Alternaria* sp. on *Cichorium endivia*, *Uromyces anthyllidis*, *Gloeosporium fructigenum*, and *Coccomyces hiemalis*. There are 31 references.

California aster yellows on vegetable and seed crops, H. H. P. SEVERIN and N. W. FRAZIER (*Hilgardia* [California Sta.], 16 (1945), No. 12, pp. 573-596, illus. 15).—The host range of aster yellows among economic plants spontaneously infected includes 11 vegetables and 12 seed crops belonging to 14 species of 12 genera in 6 families, including those previously reported (E. S. R., 61, p. 238; 68, p. 491; 84, p. 485). The virus overwinters in biennial and perennial plants and overwintering leafhoppers. The symptoms are described for each species or variety proved to be spontaneously infected.

Weed-host range of California aster yellows, N. W. FRAZIER and H. H. P. SEVERIN (*Hilgardia* [California Sta.], 16 (1945), No. 12, pp. 619-650, illus. 10).—Leafhopper vectors of California aster yellows were found to complete their life cycles on various weed species as follows: The short-winged aster leafhopper—*Macrostelus divisus* (Uhl.)—on 19 species, the long-winged race on 25, the mountain leafhopper—*Colladonus montanus* (V. D.)—on 27, and the geminate leafhopper—*Idiodonus geminatus* (V. D.)—on 28 species. The longevities of adult ♂♂ of the 4 vectors on 67 weed species are compared.

Experimentally 25 species of weeds belonging to 24 genera in 14 families were infected with the aster yellows virus by means of 1 to 4 vectors; they included 22

annuals, 2 biennials, and 1 perennial. The virus, recovered by previously non-infective short-winged or long-winged aster leafhoppers from the infected weeds, was transferred to asters. Six species of inoculated weeds developed symptoms of aster yellows, but the virus was not recovered. Partial disappearance of symptoms occurred in some of the species. In all, 41 species of weeds belonging to 31 genera in 14 families were demonstrated to be spontaneously infected with the aster yellows virus; they include 28 annuals, 5 annuals or biennials, 4 biennials, and 4 perennials. The virus was recovered by previously noninfective short-winged or long-winged aster leafhoppers from the infected weeds and transferred to asters. Although 5 additional weed species exhibited typical symptoms under natural conditions, all efforts to recover the virus from them proved unsuccessful. The virus overwinters in annual, biennial, and perennial weeds and in its leafhopper vectors.

Host-range differences included 3 weed species (family Leguminosae) apparently reacting differently to the California and New York strains of the virus, although it is unknown whether these species were subjected to experimental infection by L. O. Kunkel. Overlapping host ranges of the two strains of viruses include 3 weed species. The symptoms are described for each weed species proved to be either experimentally or spontaneously infected with the virus.

Notes on physiologic specialization in *Puccinia graminis tritici* Erikss. and Henn. in China, S.-Y. YIN (*Phytopathology*, 35 (1945), No. 11, pp. 939-940).—Among 175 collections of *P. graminis tritici* from 12 Chinese provinces, the writer identified 12 previously known and 2 new physiologic races, which are described. Races 15, 107, and 122 were most prevalent; race 122 was also the most widely distributed, occurring in 9 of the 12 provinces. These findings constitute the second published record of physiologic specialization of wheat stem rust in China.

Études expérimentales sur les Urédinées hétéroiques réalisées au Laboratoire de Botanique de l'École Nationale d'Agriculture de Grignon (Seine-et-Oise) au cours des années 1942 et 1943 [Experimental studies of the heteroecious Uredineae], A. L. GUYOT (*Ann. École Natl. Agr. Grignon, Ser. 3, 4 (1943-44), pp. 116-147*).—These studies consider one species of *Uromyces* and nine of *Puccinia*, including trials of *P. graminis* on a large number of host plants. A brief note refers to rusts of various members of the grass family.

Copper sulphate as an eradicant spray for powdery mildews, C. E. YARWOOD. (Univ. Calif.). (*Phytopathology*, 35 (1945), No. 11, pp. 895-909, illus. 9).—Addition of spreader (glyceryl alkyl resin) to water sprays decreased the deposit but increased the coverage on cantaloup and bean leaves. Wet spray deposit on lower leaf surfaces of cantaloup decreased from about 2.6 gm. per square decimeter when sprayed without spreader to 1.25 gm. per square decimeter when spreader was added to the spray; on lower leaf surfaces of bean the corresponding decrease was from 1.5 gm. to 0.5 gm. per square decimeter. Injury from CuSO_4 sprays was measured on field- or greenhouse-grown bean, cucumber, cantaloup, beet, grape, pea, hop, mustard, potato, tomato, rose, and apple foliage. The concentration to cause 50 percent injury varied from a minimum of 0.035 percent CuSO_4 for mustard to a maximum of over 10 percent with beet. CuSO_4 injury was usually less when a spreader was added to the spray, but bordeaux injury to greenhouse-grown beans was greater when a spreader was added. A 50 percent injury to bean required about 10 times as much Cu in the form of bordeaux as in the form of CuSO_4 .

Eradication of bean powdery mildew was secured at lowest Cu dosages with CuSO_4 plus spreader. For 95 percent eradication a spray containing about 0.04 percent CuSO_4 plus spreader was required; similar control required about 2.4 times as much Cu as CuSO_4 without spreader, 6.4 times as much in bordeaux plus spreader, and 18 times as much in bordeaux without spreader. On the basis of maximum control with minimum injury, 0.06 percent CuSO_4 plus spreader proved

most effective, followed in order by 0.4 percent bordeaux plus spreader, 0.8 percent bordeaux without spreader, and 0.08 percent CuSO_4 without spreader. The other soluble coppers used (CuCl_2 , $\text{Cu}(\text{NO}_3)_2$, and copper acetate) appeared about equal to CuSO_4 as eradicant sprays, but the insoluble coppers (bordeaux, burgundy, cuprous oxide, basic copper sulfate, copper oxychloride, and copper carbonate) were distinctly less effective; CuSO_4 plus spreader also proved superior to several other nonsulfur and noncopper chemicals tested.

Conidia of *Erysiphe polygoni* from bean or mustard germinated well on the surface of solutions containing 10 per cent CuSO_4 . The spray concentration necessary for 95 percent eradication of bean and cucumber powdery mildews decreased from a maximum of about 0.3 percent CuSO_4 applied at time of inoculation to about 0.03 percent applied 8 days afterward. Eradication of bean mildew was secured with lower concentrations of CuSO_4 spray applied by day than by night. Heavier dosages of most sprays were needed for protection than for eradication. For 95 percent control about 100 times as much CuSO_4 was necessary in protective as in eradicant applications. The green weight of foliage and yield of fruit on bean, cucumber, and cantaloup plants on which powdery mildew was controlled in greenhouse and field tests with eradicant applications of CuSO_4 plus spreader was greater than on similar unsprayed plants.

Dust treatments for vegetable seed, W. B. TISDALE, A. N. BROOKS, and G. R. TOWNSEND. (*Florida Sta. Bul.* 413 (1945), pp. 32, illus. 1).—The seed treatments here described are recommended to prevent seed decay and death of young seedlings before they emerge from the soil—in other words, the pre-emergence damping-off which results in poor stands; as to the post-emergence phase, seed treatments offer but little protection. The experiments reported were designed to evaluate under Florida conditions several fungicidal materials prepared and recommended by their manufacturers for treating seed. Most of them are on the market, but several were distributed for experimental purposes only; they included copper carbonate, Cuprocide, zinc oxide, Arasan, Spergon, New Improved Ceresan, phenyl mercury compounds, Semesan, and Vasco-4. The results for some 22 vegetables are described in detail and tabulated. General directions and precautions for treating the seed are also given.

Control of barley smuts, C. M. HAENSELER (*New Jersey Stat. Plant Disease Notes*, 22 (1945), No. 8, pp. 29–32).—The results obtained in experimental application of hot water treatment of a foundation barley grown for certified seed production over a period of 5 yr. proved so practical and valuable that the method has been adopted voluntarily by all certified barley seed growers in New Jersey. In 1941 a survey in Cumberland County revealed the percentage of loose smut to range in barley fields from about 7 to about 21 (average 14) so that all fields entered for certification had to be rejected. The method of treating foundation seed with the standard hot water treatment has led to such a reduction in the amount of loose smut that State certifying agents are now finding generally only a fraction of 1 percent of the disease in fields entered for certification and never more than 2 percent. It has been demonstrated, therefore, that in New Jersey it is not necessary to treat all barley seed with hot water if foundation seed produced under the system of State certification is properly hot water-treated. Certified seed is usually produced the second year following the production of foundation seed. Registered seed is grown from foundation seed.

Desinfestantes del "carbon de la cebada" [Disinfectants for barley smut], D. VOLOSKY DE HERNANDEZ ([*Chile Agr. Téc.*, 5 (1945), No. 1, pp. 37–47, illus. 1; *Eng. abs.*, pp. 46–47).—The results of 4 years' experiments on the control of infection by *Ustilago hordei* with seed treatments are analyzed statistically and discussed. Abavit and Hydrit are said to have given perfect control and Mercysol good results

in all but 1 yr.; Tillantina was only fair, and copper carbonate gave only slightly better results than untreated seed, while the effects of formaldehyde were erratic. Even though there were great differences in fungicidal power among the treatments, there were no significant differences in barley yields.

Epidemiology studies on stripe rust of wheat in Chengtu Plain, China, L. LING (*Phytopathology*, 35 (1945), No. 11, pp. 885-894, illus. 1).—Stripe rust (*Puccinia glumarum*) is destructive to wheat at altitudes of 576 m. (749 ft.) in Chengtu plain, Szechuan Province, during February-April but is seldom present on wheat during May-November. At approximately 3,000 m., in the surrounding mountains, stripe rust may be destructive to wheat from late June until August. The urediospores may oversummer at the high altitudes, and during fall the air currents carry them to the plain about the time wheat is sown in October. Urediospores overwinter in the plain, where temperatures seldom drop below 0° C. Stripe rust was most severe in Chengtu plain when the rainfall was well distributed during late winter and early spring, with high atmospheric humidity and cloudy days, and when low temperatures delayed maturity and favored repetition of the uredial stage of the fungus. The optimum temperature for urediospore germination was 11.5°. Under the high humidities prevailing in Chengtu plain, urediospores seldom retained their viability more than a month. Stripe rust also attacks *Agropyron ciliare* and *A. semicostatum*; urediospores from these grasses attacked varieties of barley but not of wheat among the series of differential hosts; infected grasses thus probably do not furnish inoculum for the wheats grown in Chengtu plain. *P. trititica* and *P. graminis* also occur in this region, but stripe rust is often the most important factor in reducing wheat yields.

Epiphytology of winter wheat mosaic, F. JOHNSON. (Ohio State Univ.). (*Ohio Jour. Sci.*, 45 (1945), No. 3, pp. 85-96, illus. 2).—Wheat mosaic is said to be present in seven States (Ill., Ind., Kans., Md., Nebr., N. C., and Va.); from abroad, it has been reported in Egypt, Japan, and Russia. East of the Mississippi River, the virus is transmitted to susceptible plants through the soil, producing two types of symptoms, viz, (1) a stunted rosetted condition with or without mottling in the Harvest Queen variety and (2) in other varieties such as Purdue No. 1, Purkof, and Illinois No. 2 an early and predominant mottling, pronounced stunting without excessive tillering, and vacuolated intracellular bodies. The virus can be mechanically transmitted—but with difficulty—from diseased to healthy plants. Inoculum extracted from the roots of diseased plants failed to infect via the rubbing or needle-prick methods of inoculation. It proved possible, however, to induce the disease by artificially subjecting the plants to temperatures normal for winter wheat after allowing them to grow in virus-infested soil for 18 days. Five insects—*Laevocephalus* (*Deltoccephalus*) *striatus* (L.), *Agalia sanguinolenta* (Prov.), *A. constricta* Van Duzee, *Delphacodes campestris* Van Duzee, and *Toxicoptera gramineum* Rond.—as well as nematodes failed to transmit the virus. Several plant species were tested for susceptibility via mechanical inoculation, but symptoms were produced only in wheat. The only practical control method for areas where the disease is prevalent seems to be the planting of resistant varieties; several of these have produced good yields in virus-infested land. Two viruses may be considered as causing mosaic of winter wheat in the United States. The one east of the Mississippi is transmitted via the soil and is responsible for the vacuolated intracellular bodies; the western form is not carried via the soil and induces no such bodies. The Japanese mosaic virus is believed closely related to the eastern form in the United States, but the Russian form has characteristics of both the eastern and western viruses. There are 35 references.

Preliminary studies on physiologic specialization in *Tilletia tritici* and *T. levis* in China, T. F. YU, H. R. WANG, C. T. FANG, and S. Y. YIN (*Phytopathology*, 35

(1945), No. 11, pp. 879-884).—Four physiologic races of *T. tritici* and six of *T. levis* in China were identified on the basis of differences in pathogenicity to Marquis, Mindum, and 2H80 wheat. *T. levis* strongly predominates in northern and *T. tritici* in southern China. Race 1 of *T. tritici* is most widely distributed in southwestern China; races 1, 2, and 3 have been found in the northwestern corner of Yunnan Province, where bunt is usually epidemic. The variety 2H80 is valuable for breeding wheat resistant to bunt for this part of China, since it possesses many desirable agronomic characters in addition to its resistance to these three races of *T. tritici*.

Identificación de razas fisiológicas del *Puccinia graminis tritici* y *P. triticea*, algunos estudios efectuados en Chile [Identification of races of *P. graminis tritici* and *P. triticea* in Chile], D. VOLOSKY YADLIN ([Chile] *Agr. Téc.*, 5 (1945), No. 1, pp. 70-78; *Eng. abs.*, pp. 77-78).—The existence in Chile of races 11, 14, 15, and 17 of stem rust was reaffirmed. Forty-two wheat varieties from the United States were tested against a mixture of races among which 15 was the most virulent; 5 varieties reacted as if immune. The importance of discovering the way in which *P. graminis* passes its critical period in Chile is emphasized, and details of the method of determining physiological strains of both rust fungi are described. Two new races of leaf rust—71 and 85—are added to the list of those previously known in Chile.

Raising the resistance of grasses to rust (*Puccinia*), K. SUKHORUKOV and O. SMIRNOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 47 (1945), No. 4, pp. 304-306).—When wheat and rye plants were sprinkled with solutions of urea or ammonium dihydrogen phosphate and inoculated the following morning with suspensions of urediospores, the resistance to infection was in all cases raised. A sharp increase of resistance was observed for forms of rust low in aggressiveness; this increase was less conspicuous for the more virulent forms. Immunity and resistance to rust are believed to be based on some physiological peculiarities of the N exchange in infected plants.

Control of internal boll rot of the cotton plant, caused by insect punctures (*Dysdercus* sp.), through selection of resistant strains, T. B. BARBUCCI, G. G. RÁDA, and J. WILLE (*Nature [London]*, 156 (1945), No. 3956, pp. 235-236, illus. 1).—One of the main problems related to cotton production in irrigated valleys of the northern coastal part of Peru concerns the damage associated with a cotton stainer (*D. ruficollis* L.). This preliminary report deals with bacteria and fungi isolated from affected bolls (*Nematospora* not yet found) and their inoculation into cotton strains. A large portion of the inoculated bolls rotted, but a few plants of four strains exhibited "resistance" to infection; these results suggest a possible avenue for control of stainer damage by plant selection.

Genetic leaf roll of Irish potato seedlings, E. L. LECLEGG. (U. S. D. A. coop. La. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 11, pp. 877-878, illus. 1).—The author reports a leafroll of small greenhouse-grown seedlings from true seed in which the leaf margins roll upward beginning with the lower and extending to the apical leaves. Many of the affected leaves have a red-purple tinge along the margins shortly after rolling becomes evident. Stem-graft inoculations with these plants on unaffected stocks all gave negative results, apparently indicating the condition to be of nonvirus origin. The progeny of tubers from affected plants failed to show any type of leaf rolling during the growing season in the field—a further evidence against the virus origin of the condition. Because of the small number of segregates in many of the progenies it was impossible to formulate a genetical factorial explanation of this character, which is believed due to a recessive factor.

New form of latent mosaic discovered (*Wisconsin Sta. Bul.* 466 (1945), pp. 10-11, illus. 2).—A note on an aberrant strain of the potato latent ring-spot virus

found attacking some of the newer and better potato varieties, and the first report of a strain of latent ring-spot virus causing a mosaic disease of potatoes in the United States.

Wildfire disease of soybeans, W. B. ALLINGTON. (U. S. D. A.) (*Phytopathology*, 35 (1945), No. 11, pp. 857-869, illus. 4).—Wildfire (*Pseudomonas tabaci*) is reported as causing damage to soybeans in most of the heavy producing areas of the United States. Comparisons of cultures from soybean and tobacco from the standpoints of morphology, physiology, serology, and pathology revealed no clear-cut differences. Most of the infection was found to take place in water-soaked tissue produced by beating rains. Penetration by the pathogen is immediate, and the infection process is practically independent of the duration of the water-soaked condition. Enlargement of old lesions was induced by water soaking the leaf tissue at the margins for short periods.

Tip burn of sugar beet with special reference to some light and nitrogen relations, J. M. FIFE and E. CARSONER. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 11, pp. 910-920, illus. 3).—This tipburn is believed to be caused by excessive accumulation of a substance or substances normally present in the plant; it develops when beets grown in fertile soil with an abundance of N over a relatively long time are transferred to a low light intensity—N and light factors both being requisites. When the outer leaves are left on the beet plant and exposed to full sunlight tipburn fails to develop on the new leaves even when they are shaded. The toxic substances involved are apparently accumulated in the root and are probably normal nitrogenous constituents of the plant, but temporarily in excessive concentrations. Complete recovery from tipburn occurs when affected plants are grown under high light intensity and conditions otherwise favorable for beet growth. Sugar beets are, in general, highly heterozygous and vary widely in their sensitiveness to the complex of factors causing tipburn.

Estudio comparativo del mosaico de la caña de azúcar en diferentes países [Comparative study of sugarcane mosaic in different countries], J. MATZ (*Rev. Inst. Defensa Café Costa Rica*, 15 (1945), No. 128-129, pp. 383-390, illus. 2).—An address.

A bacterial streak disease of *Phleum pratense* L., J. R. WALLIN and C. S. REDDY. (Iowa Expt. Sta.). (*Phytopathology*, 35 (1945), No. 11, pp. 937-939, illus. 1).—Specimens of this disease of timothy grass were collected along Wisconsin and Iowa roadsides and in hay fields and pastures. The water-soaked translucent streaks on the leaves were similar to those caused by *Xanthomonas translucens* on barley, brome grass, rye, and wheat. Under severe attack the emerging timothy heads were sealed in the spiral whorl by bacterial exudate or were malformed on emergence. The surfaces of young lesions were often covered with yellowish droplets of bacterial exudate. A yellow bacterium culturally and biochemically like *X. translucens* was isolated from the diseased tissues. Repeated cross inoculations on barley, brome grass, oats, rye, timothy, and wheat revealed the bacterium to be pathogenic only to timothy; it is described as *X. translucens phleipratensis* n. var.

Krommek disease of tobacco; a mathematical solution to a problem of disease, J. E. VAN DER PLANK and E. E. ANDERSEN (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 240 (1944), pp. 6).—According to the authors, there is no breeding of vector species of thrips on tobacco leaves, and within fields of Virginia tobacco—which for culture purposes is prevented from flowering—there is ordinarily no multiplication of vectors. Their hypothesis assumes that infection with krommek disease (spotted wilt) in a field is built up by vectors invading from without, settling at random, and remaining without spreading the disease from plant to plant. On this basis they calculate that increasing the number of plants per acre n times would reduce the proportion of infected plants from $1 - q$ to $1 - \sqrt[n]{q}$, where q

is the proportion of healthy plants at standard density of planting. A fairly wide range of experiments with different varieties confirmed this calculation within reasonable limits of accuracy. The density of planting may be increased by setting out several plants per hill without altering the spaces between hills, so that there is no gap in a row unless all plants in a hill become infected. With n plants per hill, the proportion of hills totally infected is $(1 - \sqrt[n]{q})^n$, where q has the same meaning as above. A table is given for $n = 2$ and $n = 3$, which shows that planting in pairs suffices to cope with an epidemic which would have destroyed 40 percent of a crop set out in the usual way with one plant per hill. Planting in threes has sufficed for all but abnormally severe outbreaks. The method of denser planting is especially apt during the first month or two after transplanting; it is during this period that the worst danger of krommek exists in the Transvaal.

Plant nutrition in relation to disease development.—II, Cabbage clubroot, J. C. WALKER and W. J. HOOKER. (Univ. Wis. and U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 8, pp. 487-490).—In this study (E. S. R., 93, p. 730) of the development of clubroot in young cabbage, increases of the salt concentration in a balanced solution tended to raise the disease index. Excess of K and N increased this index; increase of P had little effect. Omission of K or P usually lowered the disease index; omission of N raised it. When light and salt concentration favored growth of the host, the effect of salt balance was less evident than under conditions where the plant grew more slowly.

Studies on the Fusarium of muskmelon wilt.—II, Infection studies concerning the host range of the organism and the effect of environment on disease incidence, J. J. MILLER (*Canad. Jour. Res.*, 23 (1945), No. 5, Sect. C, pp. 166-187, illus. 11).—In this study (E. S. R., 93, p. 302), a comparison of disease incidence resulting from equal degrees of infestation of sterilized and nonsterilized soils led to the conclusion that the factor responsible for suppression in nonsterilized soils is biological. Temperature studies indicated a definite decrease in incidence above 30° C., but no minimum temperature was found below which the host plant grew well and at the same time escaped infection. Low soil moisture seemed to accentuate the disease incidence. Seedlings grown in spontaneously infested soil seldom wilted; since the fungus was shown to be present there, a protective effect must have been operating; this situation was found associated with a severe stunting, and both phenomena appeared to be caused by biological factors. Evidence indicated that the wilt *Fusarium* (identified as closely similar to *F. bulbigenum niveum* f. 2) was unimportant in relation to the stunting. Culture variants of the pathogen proved less virulent than the wild type on all host varieties tested, emphasizing the importance of employing the highly virulent wild type strain when infesting soils for resistance trials. There are 16 references.

Pea diseases and their control, L. L. HARTER, W. J. ZAUMEYER, and B. L. WADE (*U. S. Dept. Agr., Farmers' Bul.* 1735, rev. (1945), pp. 28+, illus. 17).—"In this bulletin [revised (E. S. R., 72, p. 640)] the diseases and their causes are described briefly so that growers can recognize them and apply the recommendations for preventing or controlling them."

Bacterial leaf spot of pepper, C. M. HAENSELER (*New Jersey Stas. Plant Disease Notes*, 22 (1945), No. 9, pp. 33-36).—In certain seasons and in specific fields this disease is said to hold first place among New Jersey pepper disease problems. Sprays have not proved very practical, but seed treatment by 1-2,000 HgCl₂ solution has given satisfactory results over the past several years. Recent attempts to eliminate the disease by this method on a community basis have given very promising results.

Varietal resistance of tomato seedlings to the stem-lesion phase of Alternaria solani, W. D. MOORE and G. B. REYNARD. (U. S. D. A., Ga. Coastal Plain and Ga. Expt. Stas., et al.). (*Phytopathology*, 35 (1945), No. 11, pp. 933-935).—

Field tests were conducted for 3 yr. on the comparative resistance of tomatoes to the stem-lesion phase of *A. solani*, pure lines and crosses of the following varieties being used: Marglobe, Indiana Baltimore, King George, Danish Early, Targinnie Red, Devon Surprise, Norduke, Montgomery, and Pan America. The pure lines of Targinnie Red, Devon Surprise, Norduke, and their several crosses proved significantly more resistant to stem infection than Marglobe.

Wet soil promotes tomato rot, L. R. BRYANT and W. A. KREUTZER. (Colo. State Col.). (*Food Packer*, 26 (1945), No. 8, pp. 59-60, illus. 1).—The fungus (*Phytophthora capsici*) was found not to develop in either dry or slightly moist soil; it must be wet. Since the swarm spores are very sensitive to certain chemicals, it was thought that their use as sprays or dusts might reduce the amount of fruit rot. In field tests, spraying with yellow cuprocide, copper oxychloride, and bordeaux reduced the incidence of rot by as much as 50 percent—and under extremely severe conditions. Promising results were also obtained by applying a copper salt in the irrigation water under heavy inoculation and overhead irrigation.

Leafhopper oviposition, the cause of one form of apple measles, J. C. DUNEGAN and D. ISELY. (Ark. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 35 (1945), No. 11, pp. 870-876, illus. 2).—The pustular type of measles was described from Arkansas material in 1912 by Hewitt and Truax (E. S. R., 29, p. 649). A study of material collected more recently convinced the authors that this type still occurs in Arkansas; they found, however, that the pustules are caused by insertion of the winter eggs of the white apple leafhopper into the twigs. Histological features similar to those previously described as characterizing the pustular stage were found in apple-twig tissues injured by leafhopper oviposition. This, then, is concluded to be responsible for the condition, rather than a physiological cause, as Hewitt and Truax thought.

Effect of pre-storage treatments on the incidence of scald of Rhode Island Greening apples, S. A. PIENIAZEK and E. P. CHRISTOPHER. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 123-130).—Delayed storage—keeping fruits at 78° F. for 10 and 20 days—prevented scald but in most cases resulted in off-flavors. Acetic acid and NH₃ vapors had no effect on scald when used during short prestorage treatments. Sealing fruits in tight jars for a few days at storage or room temperatures prior to storage in most instances prevented scald if sufficient time were allowed. Prestorage treatments with atmospheres of 30 and 60 percent CO₂ at room temperature for 1 to 4 days gave some control, but the results were erratic and inconsistent. Prestorage treatments with atmospheres of 30 and 60 percent CO₂ at storage temperatures for 3, 6, and 10 days resulted in very good scald control; no off-flavor developed, and ripening was delayed.

Les pourritures des pommes et des poires sur le marché français [Rots of apples and pears on the French market], G. VIENNOT-BOURGIN and J. BRUN (*Ann. Ecole Natl. Agr. Grignon, Ser. 3, 4* (1943-1944), pp. 181-215, illus. 11).—The authors present the results of several years' study as to the causes of market decay in apple and pear fruits, together with a review of the literature of the subject (66 references).

Cracking and decay of Bing cherries as related to the presence of moisture on the surface of the fruit, F. GERHARDT, H. ENGLISH, and E. SMITH. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 191-198, illus. 2).—The cumulative effects of rains over a 4-day period at harvest caused an increasingly larger amount of cracking in Bing cherries the longer they remained on the tree. Increases in decay and loss of weight of the rain-damaged fruit after picking were directly correlated with intensity of cracking and time of harvest; no healing occurred during storage at 40° F. The temporary condensation of moisture on the fruit surfaces at 40° failed to increase the decay, but short periods at 50° without

sweating increased it significantly. Failure of sweating to stimulate decay is explained by the fact that the film of moisture on the surface was not retained long enough to permit germination of mold spores at the latter temperature. Hydro-cooling of Bing cherries with iced water at 32° for as long as 30 min. failed to cause injury; the appearance of the fruit was comparable to that cooled in air at 32° and 85 percent relative humidity.

Viruses and cherry rootstocks, E. M. HILDEBRAND (*Amer. Nurseryman*, 82 (1945), No. 7, pp. 5-8, 18-21, illus. 4).—This is a general discussion of the virus diseases of sweet and sour cherries, including their history, the propagation problem, scions and budwood, rootstocks, the orchard and nursery virus situations, the relation of plants growing in the wild, brief descriptions of the individual diseases, and a program of action.

Field results on the control of certain grape diseases in New York, R. F. Surr (*New York State Sta. Bul.* 712 (1945), pp. 26, illus. 7).—Black rot (*Guignardia bidwellii*), downy mildew (*Plasmopara viticola*), and powdery mildew (*Uncinula necator*) are of major importance to grape production in New York State. The susceptibilities of the leaves and bunches of 11 varieties to these diseases as observed in the field during 1940-44 are recorded. Bordeaux applied to plots previously treated with an eradicant fungicide, such as Elgetol, gave no increase in the control of these diseases as compared with bordeaux alone. Bordeaux at 2-2-100 to 8-8-100 gave effective experimental control of all three diseases; the 4-4-100 formula was as effective as the 8-8-100 and would be more reliable than the 2-2-100 against black rot and downy mildew, while the 2-4-100 formula gave excellent control of powdery mildew. Bordeaux applied before bloom, immediately after bloom, and 2 weeks after bloom proved sufficient to control downy mildew; it also controlled black rot in 1940-41, but five applications were necessary in the 1944 tests. Two applications—one immediately after bloom and the second 10 to 14 days after bloom—controlled powdery mildew. Addition of rosin fish oil soap to the bordeaux bettered the disease control on the bunches but gave no significant difference in the control of downy mildew on the foliage. In general, better control of the three diseases was obtained with Yellow Cuprode than with any of the other six insoluble coppers tested; except in one or two individual tests, none of them gave better control than bordeaux. In limited trials, three applications of Fermate 2-100 showed better control of black rot than any other fungicide tested. An experimental material—U.S.R. No. 604 (2,3-dichloronaphthoquinone)—proved superior for combating downy mildew but caused some injury.

A graft-transmissible mosaic disease of grapevine, W. R. HEWITT. ((Univ. Calif.). (*Phytopathology*, 35 (1945), No. 11, pp. 940-942, illus. 1).—This disease was found in a California vineyard during the summer of 1943. The leaves of affected vines exhibited varying degrees and patterns of chlorosis, occurring as narrow yellow bands along the small veins, as irregular yellow or cream colored blotches along the large veins, as a cream stippling over the leaf surface, and as a light green mosaic with some vein-clearing. The mosaic was transmissible by grafting but not by juice inoculation. The incubation period for leaf symptoms ranged from 4 to 5 mo.

The pathological aspects of avocado decline, G. A. ZENTMYER, L. J. KLOTZ, and P. A. MILLER (*Calif. Citrog.*, 31 (1945), No. 1, pp. 26-27, illus. 1).

A more virulent black pit organism on citrus, C. O. SMITH and L. J. KLOTZ. (*Calif. Citrus Expt. Sta.*). (*Phytopathology*, 35 (1945), No. 11, pp. 942-943, illus. 1).—In some California groves large spots were observed on lemon and Valencia orange fruits; these were either solitary or associated with the typical black pits caused by *Phytophthora syringae*. Cultures from the pit lesions and margins of the spots gave bacterial growth typical of the black pit organism. Lemons inoculated with these cultures developed spots reaching a maximum diameter of 1.5 in.

La podredumbre del pie de los citrus en la Provincia de Córdoba, Argentina; importancia, etiología y medios de lucha [Citrus foot rot in Cordoba Province, Argentina; its importance, etiology, and control], M. J. FREZZI and T. MACOLA (*Rev. Argentina Agron.*, 12 (1945), No. 3, pp. 203-211, illus. 3).—*Phytophthora* species are involved.

Notes on copper spray damage to citrus trees, L. J. KLOTZ and J. T. MIDDLETON (*Calif. Citrog.*, 31 (1945), No. 1, pp. 14-16).

Pressure injection of iron sulfate into citrus trees, R. W. SOUTHWICK (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 27-31, illus. 2).—Liquid pressure injections of ferrous sulfate at 50-100 gm. per tree corrected chlorosis for 2 to 4 yr., with an even distribution of Fe throughout the tree. This method occasionally caused severe injury to the small twigs; the reason was not determined.

Scab of Cinchona in South America caused by Elsinoe, A. E. JENKINS. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 11, pp. 344-352, illus. 3).—The symptoms of this disease, described and illustrated as leaf spots, stem cankers, and capsule lesions, and the diagnosis of the causal fungus *E. cinchonae* n. sp. are based particularly on material recently collected in Colombia by F. R. Fosberg and W. C. Davis. A general statement as to its range in Colombia, Ecuador, and Peru is included. There are 20 references.

Additional ornamental flowering plants naturally infected with California aster yellows, H. H. P. SEVERIN and J. H. FREITAG (*Hilgardia [California Sta.]*, 16 (1945), No. 12, pp. 597-618, illus. 10).—Among ornamental flowering plants in California, 45 species and 1 interspecific hybrid belonging to 36 genera in 17 families are shown to be spontaneously infected with aster yellows. Previously noninfective short-winged and long-winged aster leafhoppers (*Macrostelus divisus* (Uhl.)) recovered the virus from the spontaneously infected plants and transferred it to healthy aster or celery. The symptoms on flowering ornamentals so infected varied according to the size of the plant when infected. Noticeable symptoms include stunting, shortening of the internodes, production of axillary shoots from the bud normally dormant in the axil of each leaf, upright or vertical position of the leaves and stems, cleared venation, and cupping, twisting, and chlorosis of the leaves. The most striking symptoms are phyllody and virescence and proliferation of the flowers.

Susceptibility of Yoshino, Akebono and Beni-higan flowering cherry trees to spray oil injury, H. V. WESTER (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 412-422, illus. 1).—The author reports a serious twig and branch die-back of Yoshino, Akebono, and Beni-higan flowering cherry trees in Washington, D. C., presenting evidence from a survey in 1940 that it resulted from injury caused by a miscible spray oil, diluted 1-19. Though similarly sprayed, the varieties Kwanzan, Shirofugen, Tanko-shinju, Gyoiko, and Sargent were not affected. Tests in 1941 with miscible oil 1-19, oil emulsion 1-24, and lime-sulfur 1-9 on old and young Yoshino trees established the injury observed in 1940 to have been from the oil. The symptoms are described. Tests in 1942 with miscible oil 1-19, oil emulsion 1-29, and lime-sulfur 1-9 on old and young Yoshino trees indicated that old trees may be injured almost as readily by oil when the buds are tight as when quarter to half swollen but not the young trees, which proved susceptible to the miscible oil only when the buds were quarter to half swollen and to oil emulsion only when they were half swollen. Lime-sulfur was practically noninjurious. In 1943, miscible oil tested on old Yoshino trees when the buds were just beginning to swell resulted in negligible injury. The wide differences in injury to Yoshino trees by spray oil under apparently identical conditions are suggested as possibly attributable to variations in the power of the sap to oxidize the innocuous hydrocarbons of spray oils into harmful amounts of asphaltogenic acids.

Pathogenicity of the vascular *Fusarium* of gladiolus to some additional iridaceous plants, W. D. McCLELLAN. (U. S. D. A.). (*Phytopathology*, 35 (1945). No. 11, pp. 921-930, illus. 3).—The following Iridaceae were tested in the greenhouse for susceptibility to *F. orthoceras gladioli*: *Babiana* hybrids, *Crocus* (spring flowering), *Freesia* seedlings, *Homeria collina*, bulbous iris varieties Emperor, Poggenbeek, and Wedgewood, *Ixia* hybrids, *Neomarica gracilis*, *Sparaxis* (assorted), *Streptanthus cuprea*, *Tritonia crocata*, *T. lineata*, and *Watsonia* (assorted); infection was uncertain in the genera *Neomarica* and *Homeria*, but was positive in all the others as shown by reddish-brown vascular discoloration in one or more bulbs or corms. Rotting of the roots and corm or bulb bases was a general symptom in all infected genera; it was the predominating one in the bulbous iris, whereas the characteristic symptom in *Crocus*, *Ixia* and *Watsonia* was the typical reddish-brown vascular discoloration. A *Fusarium* isolated from bulbous iris from Oregon and one from Texas proved nonpathogenic to the Picardy and Dr. F. E. Bennett varieties of gladiolus. In view of these findings it is suggested that members of the Iridaceae should not be grown in association where the vascular *Fusarium* is known to be present.

The common leaf rust of cultivated roses, caused by *Phragmidium mucronatum* (Fr.) Schlecht, V. W. COCHRANE ([*New York*] *Cornell Sta. Mem.* 268 (1945), pp. 39, illus. 9).—A single-urediospore clone of *P. mucronatum*, originating on hybrid tea roses in California, caused infection of *Rosa setigera*, *R. carolina*, *R. virginiana*, *R. kamtchatica*, *R. blanda*, and *R. californica* but not *R. gallica*, *R. palustris*, *R. rudiuscula*, *R. arkansanae*, or the climbing China variety Ragged Robin. Teliospores overwintered outdoors at Ithaca, N. Y., germinated in May, and inoculation of rose leaves with their sporidia was followed by development of the aecial stage. Attempts to advance the date of teliospore germination failed. The fungus may be heterothallic. The extreme limits of urediospore germination were 6° and 28° C.; the optimum for both total and rate of urediospore germinability was 15°-21°, and germ tube growth was greatest at 18°. The temperature limits and optimum of aeciospore germination were approximately the same. Teliospore germinated at 6°-25° (optimum 18°); the promycelium failed to segment or form sporidia. Germination of aeciospores and urediospores occurred only in the presence of liquid water.

Infection by urediospores occurred at 9°-27°, with the optimum at 18°-21°; liquid water proved necessary to infection. Rose plants inoculated with urediospores and held at 18° in a moisture-saturated atmosphere for as little as 4 hr. developed some infection, though 12 hr. were better; no lesions developed on plants held only 2 hr. Immature urediospores were lower than the mature in viability; spores were mature 24-48 hr. after formation. Following detachment from the leaf, immature spores ripened in vitro equally well at 3° and 18°. Urediospores in leaf lesions outdoors exhibited a maximum longevity of 49 days during spring, summer, and fall and of 70 days in winter; their longevity on stored leaves was greatest at 25-75 percent relative humidities and at low temperature (3°); their maximum longevity (365+ days) was at 3°. Humidity exerted its greatest influence on survival at 12°-27°. Urediospores at -15° lived not more than 56 days. In general, detached spores under a given set of conditions survived somewhat longer than did those on leaves. Survival of urediospores on a wet leaf or on the surface of 2-percent water agar was low as compared to that in the absence of liquid water. On agar, the longevity varied from 18 days at 3° to 30 min. at 36°. On wet leaves, urediospores exposed to 27° were almost all dead after 24 hr. Age of leaf had no ascertainable influence on susceptibility. Urediospores caused infection only on leaves and through the lower surface; sporidia give rise to aecial lesions on both leaves and young stems.

In the eastern United States the rust is not serious, apparently because of the combined effects of the cold winter and the high midsummer temperature. The long winter, coupled with the experimentally established short life of the urediospores in nature, makes the survival dependent on the teliospore. The weather from mid-June to September is generally unfavorable in the East, although probably never so unfavorable as to eliminate a well-established infection. It is postulated that the prevalent high summer temperatures in this period slow down the spread of rust from any initial infections established in the cooler spring. In southern California, on the other hand, temperatures are uniformly favorable for the disease. The environal factor probably decisive in this area in determining its incidence is the amount and distribution of rainfall; dew and fog are of some importance during months of low rainfall. When this area is compared to the Northeast the most striking difference—besides temperature—is that winter defoliation is incomplete in California, so that susceptible leaves are always present; this frees the pathogen of dependence on the telial stage in spring, when the uredial stage is probably the chief source of inoculum. There are 58 references.

Mycoflora of buds, P. D. KEENER (*Science*, 102 (1945), No. 2650, pp. 383-384).—Several species of bacteria and a few actinomycetes were isolated from buds of *Aesculus*, *Cedrela*, *Fraxinus*, *Ginkgo*, *Magnolia*, *Populus*, and *Robinia*.

Polyporus farlowii and its rot, W. H. LONG (*Lloydia*, 8 (1945), No. 3, pp. 231-237, illus. 4).—For several years the author has found a large number of shade trees in the southwestern United States seriously attacked by a common heartrot resembling that caused in the Eastern States by *P. hispidus*; after a study of published descriptions and type material he identified the cause as *P. farlowii*, for which he presents a more technical description, details of its distribution, and further data on the type. The symptoms of the rot are described.

New research on the Dutch elm disease, G. A. ZENTMYER and P. P. WALLACE. (Conn. [New Haven] Expt. Sta.). (*Natl. Shade Tree Conf. Proc.*, 20 (1944), pp. 115-119).—This is a summary of the results of research of the preceding several years at New Haven from which it is evident that the disease can be controlled by pruning if done early enough in its course. Defoliation by cankerworms greatly increases susceptibility to the disease, and one of the most important factors influencing the development of infection in individual trees involves the number of spores with which they are inoculated and the number of inoculation points. The factors in local spread are briefly discussed, and progress in chemotherapeutic control is said to be promising.

Meadow nematodes as the cause of root destruction, G. STEINER (*Phytopathology*, 35 (1945), No. 11, pp. 935-937, illus. 2).—The role of meadow nematodes (*Pratylenchus* spp.) is discussed in relation to root injury and destruction of wild and cultivated plants. Members of the group are migratory, live mainly in cortical tissues, induce lesions, and then usually evacuate a decaying root, so that their detection is difficult. They may enter a root at any place; their aggregations frequently form nests of infestation which may ring a root, thus amputating its distal portions. Reparative growth consists in the formation of secondary roots above the lesions, producing a matted and bearded root system with only short feeders. Direct damage is further complicated in that all root-invading nematodes open the path for secondary invaders. Above-ground symptoms involve reduced growth, mid-day wilting, death of branches, bronzing of leaves, winter kill, or dieback. The over-all damage in the United States is possibly greater than that by the root-knot nematode. The effects on corn, goldenrod, and peanuts are illustrated.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Transactions of the Tenth North American Wildlife Conference (*Washington 5, D. C.: Amer. Wildlife Inst., 1945, pp. 359+*, *illus. 26*).—Some 67 conference papers by various authors are presented on land use for public hunting; waterfowl; hunting in the wake of war; production and marketing of fur; forest lands, croplands, range lands, urban lands, marshes, water, parks, and refuges in relation to wildlife; commercial fisheries; and recent developments in wildlife research.

Japanese honeysuckle in wildlife management, C. O. HANDLEY. (Va. A. and M. Col. et al.). (*Jour. Wildlife Mgmt.*, 9 (1945), No. 4, pp. 261-264).—The author presents evidence that the chief value of *Lonicera japonica* in wildlife management lies in its being an excellent cover; it also appears to be widely used as an emergency food. The main disadvantage lies in its vigorous spreading so that in certain situations it may choke out all low-growing vegetation. It can, however, be kept in check by fire or by grazing and will not withstand much shade; hence the plant is unlikely to penetrate or become objectionable in any woodland with a closed canopy.

The Roosevelt elk on the Olympic Peninsula, Washington, J. E. SCHWARTZ II and G. E. MITCHELL. (U. S. D. A.). (*Jour. Wildlife Mgmt.*, 9 (1945), No. 4, pp. 295-319, *illus. 4*).—The authors summarize the results of a 3 years' cooperative study of the number of elk, their seasonal distribution, the annual net increase, and the food resources of this range in Washington State undertaken as the basis for a comprehensive management plan for the overgrazed elk ranges in the Hoh, Queets, and Quinault Rivers. Breeding occurs between September 15 and October 15, harems are of 5 to 15 adult ♀♀, and calves are born from about May 15 to June 15. The elk usually return to the same winter range each season and browse during the winter; in the other seasons grazing and browsing are about equal. Over 100 plant species are eaten, but 25 form the main diet. The winter ranges are a few hundred feet to 2,000 ft. above sea level, and logged-off lands are important wintering grounds. Hunting and heavy winter losses have effected some improvement in forage conditions. Plants protected within fenced experimental enclosures showed marked recovery in growth and vigor. Of the 7,049 animals identified by sex and age, 70 percent were adult ♀♀, 20 were calves, 6 were adult ♂♂, and 4 percent were spike bulls; 43 percent of all cows were breeding. Bulls constituted 10 to 20 percent of the total elk population. In all, 112 elk were found dead during the study—21 from malnutrition and disease, 10 from cougar kills, and 8 from accidents. Overpopulation is a factor in increasing the incidence of parasitic infection. Cougar, bobcat, coyote, and bear are the principal predators in the Olympics. A total of 1,187 elk were killed during the three seasons; this helped to relieve the pressure on some ranges.

Symptoms of malnutrition in deer, D. HARRIS (*Jour. Wildlife Mgmt.*, 9 (1945), No. 4, pp. 319-322).

The muskrat fur industry of Louisiana, H. J. CHATTERTON (*Jour. Geog.*, 43 (1944), No. 5, pp. 185-195, *illus. 5*).—This general account of the muskrat as a fur animal includes maps showing its distribution in North America and in Louisiana, its habits, muskrat houses, its enemies, trapping, and conservation and its status in the State in furnishing fur and a substitute source of musk for the perfume trade. "From present indications, it seems fair to predict that the marshlands of south Louisiana will continue to be used for the production of muskrat furs. . . . It would be difficult to find a more profitable use of the extensive and almost uninhabitable marshlands along the Gulf coast of Louisiana," where it is said to form a distinct species—*Ondatra zibethicus rivalicus*.

Breeding potential and artificial propagation of the snowshoe hare, J. H. SEVERAID. (Univ. Maine et al.). (*Jour. Wildlife Mgmt.*, 9 (1945), No. 4, pp. 290-295).—The breeding potential in captivity was 8.7 percent young per ♀ per season, based on a gestation period of 37 days, rebreeding on the day of parturition,

and averages of 2.9 young per litter and 3 litters per season per ♀. Survival of the pen-raised hares was 84 percent during the last 2 breeding periods of 1941 due to a reduction of coccidiosis through specially constructed rearing units. The rearing of leverets by foster mothers proved successful. Even under close confinement there was reasonable tolerance in this species between sexes and between individuals of the same sex. The ♀♀ should not be mated with ♂♂ prior to March 20 if a grouping of litters and a knowledge of their probable birth dates are desired. The type of pen proving most successful was one closely resembling that used by commercial rabbitries. The production cost to age of liberation is estimated to be from \$1.25 to \$1.50 per hare.

A modified rabbit box trap for use in catching live wild rats for laboratory and field studies, C. P. RICHTER and J. T. EMLIN, JR. (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 44, pp. 1303-1308, illus. 3).—The simple and inexpensive trap described and illustrated is said to have a high efficiency for catching wild rats and to require little servicing or upkeep. A collection box and a small metal box for transferring rats from the traps to laboratory cages are also described.

Increase of rat infestation on vessels coming to New York, R. OLESEN (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 44, pp. 1295-1296).—Attention is called to the increased infestation of vessels coming to New York from foreign ports and the potential danger to public health thus entailed.

Increase of rat infestation on oil tankers, R. OLESEN and J. L. STONE (*Pub. Health Rpts. [U. S.]*, 60 (1945), No. 44, pp. 1296-1301).—Prior to the war oil tankers were generally less liable to rat infestation than any other cargo vessels; during the war, however, there was a significant increase as revealed by the fumigation records here presented. Much of this infestation is said to have been due to the construction methods in vogue before the so-called ratproof-construction era. Corrective measures are outlined, and it is reported that recently built tankers are practically immune to rat infestation.

Rodenticides—present and future, J. C. WARD (*Soap and Sanit. Chem.*, 21 (1945), No. 9, pp. 117, 119, 127, illus. 1).—This is a general survey of the rodenticide situation. "The urgency of war research has hastened the discovery of two new agents of value to man's eternal fight against the noxious rodents," viz, alphanaphthylthiourea (ANTU) and sodium fluoroacetate (1080). "The scope of the testing program now under way guarantees that both ANTU and 1080 will be added to the list of specialized rodent control agents in the near future."

The influence of methyl bromide on the rate of respiration and softening of apples, F. W. SOUTHWICK. (Univ. Conn.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 152-158, illus. 4).—Findings from this study revealed that rodent control with methyl bromide in apple cold storages is possible without measurable effects on the fruit. Fruits that have not commenced their climacteric rise in respiration may, however, find their storage life shortened; it may thus be advisable to delay fumigation in storage until a few weeks after harvest, when it would be reasonably certain that this respiratory increase had begun.

Report of the A. O. U. Committee on Bird Protection for 1944, J. M. LINSDALE, P. L. ERRINGTON, and J. A. MUNRO (*Auk*, 62 (1945), No. 4, pp. 613-619).—Land is the source of all material wealth; it is not so generally recognized how important the landscape and its various elements may be in maintaining a healthy condition among people. "Members of the American Ornithologists' Union have taken a lead in the protection of birds in accordance with both these options in the scale of attitudes toward natural resources." This is the annual report of its committee (E. S. R., 92, p. 530).

Behavior of birds during a Florida hurricane, G. M. SUTTON (*Auk*, 62 (1945), No. 4, pp. 603-606).—A description of the hurricane striking the Orlando area on October 19, 1944, and of its effects on various species of birds.

A comparison of the summer resident birds today and forty years ago in a small area in Massachusetts, S. COBB (*Auk*, 62 (1945), No. 4, pp. 606-610, illus. 1).

The third annual Iowa spring bird census, MYRLE and MARGARET JONES (*Iowa Bird Life*, 15 (1945), No. 3, pp. 42-48).—This census⁴ was taken at 14 stations (described, with names of observers) on May 11, 12, and 13, 1945; the results are tabulated.

Birds of Banff National Park, Alberta, C. H. D. CLARKE and I. M. COWAN (*Canad. Field Nat.*, 59 (1945), No. 3, pp. 83-103, illus. 1).—A brief history and description of this park and neighboring areas, and a discussion of the annotated list which makes up the main body of the contribution.

Ornithology and forest insect pests, W. L. TAYLOR (*Forestry*, 18 (1944), pp. 1-11, illus. 1).—The need is stressed for further scientific investigation into the ways of birds in woodlands and their numbers and distribution, what they eat, and how they can be attracted. Following a general discussion along these lines, the author presents a progress report on a project having as its objects the attraction of more insect-feeding birds to a hardwood forest by providing artificially constructed nesting boxes and to ascertain the effects an increased bird population might have on the periodic outbreaks of defoliating insects common in this and many other English oakwoods. Thus far the experiment shows that an efficient type of nesting box has been devised (described and illustrated), and that it is possible to establish a population of nesting birds of the order of two families per acre in this type of woodland. A bird census and lists of insects identified are included.

Comparison of animal and plant proteins for young pen-reared bobwhite quail, R. B. NESTLER, L. M. LLEWELLYN, and M. J. RENSBERGER (*Jour. Wildlife Mgmt.*, 9 (1945), No. 4, pp. 274-279).—When given a choice of balanced diets in which the essential difference was the protein supplement, the chicks preferred a diet containing 49 percent peanut oil meal, another containing a mixture of 9 percent meat and bone scraps (50 percent protein) with 38 percent soybean oil meal, and a third (control) containing a mixture of 16 percent dried buttermilk with 42 percent soybean oil meal, in contrast to diets containing sardine meal or menhaden fish meal. Feeding tests during the first 5 weeks indicated that diets containing 14 percent sardine fish meal consistently gave high live weights, low mortality, and high efficiency of feed utilization; diets with 9 to 10 percent menhaden meal produced nearly as good results. Live weights, survival, and efficiency of feed utilization were markedly better on a diet containing 9 percent meat and bone scrap (50 percent protein) than on one with 9 percent meat scrap (55 percent protein), but not as good as on diets containing fish meal without meat. The chicks grew and survived more successfully on diets containing either soybean oil meal or peanut oil meal as sole protein supplement than on those containing either linseed oil meal, cottonseed oil meal, or dried buttermilk as the sole protein concentrate; none of these proved as satisfactory as the diets containing fish meal. All chicks died on diets containing either linseed oil meal, cotton seed oil meal, or dried buttermilk as the sole source of protein; all three of these, however, gave satisfactory results when used as 10 percent of the diet. In fact, survival and efficiency of feed utilization were nearly as good on a diet containing 10 percent each of dried buttermilk, linseed oil meal, and peanut oil meal and 27 percent soybean oil meal as on diets containing fish meal.

The relation of snowy owl migration to the abundance of the collared lemming, V. E. SHELFORD (*Auk*, 62 (1945), No. 4, pp. 592-596, illus. 1).

Turkey restocking efforts in east Texas, C. C. NEWMAN (*Jour. Wildlife Mgmt.*, 9 (1945), No. 4, pp. 279-289, illus. 1).—In eastern Texas the southern pine belt terminates its western extension with an area of 10,552,600 acres of productive forest

⁴Iowa Bird Life, 13 (1943), No. 3, pp. 41-48, illus. 1; 14 (1944), No. 3, pp. 51-54.

land in the State. The western extension of the range of the eastern wild turkey conforms roughly to the pine belt. Native turkeys were gone in some counties of this region before 1883, but a few still have remnants; the last authenticated kill was in 1940. Causes for this depletion include overhunting, competition by free-ranging hogs, and removal of suitable habitat by logging. The dwindling population in eastern Texas has not been bolstered by 19 liberations of the Rio Grande turkey, but larger plantings with proper sex ratio might be more successful. Detailed results with pen-raised eastern turkeys during 1941-43 are presented; this turkey hatchery has now been abandoned, and doubt is expressed as to the advisability of further attempts at restocking with this pen-raised stock. Wild-trapped birds, used in large and repeated plantings, with an equal sex ratio, would seem to offer better opportunity for restocking even if this required introduction of the Rio Grande turkey into the former range of the eastern race. Neither pen propagation nor the introduction of Rio Grande birds is deemed as certain of success as the management of native birds where present—as in the Devil's Pocket Refuge.

Bullsnakes and their control on a Nebraska wildlife refuge, R. H. IMLER (*Jour. Wildlife Managt.*, 9 (1945), No. 4, pp. 265-273, illus. 9).—Bull snakes (*Pituophis sayi*) destroyed 42 percent of 274 duck nests under observation in a wildlife refuge in Nebraska (1938). Data are presented on the sex ratio, eggs and young, measurements and growth rates, sun tolerance, food habits including stomach examinations, and trapping and its effects on the species. Bull snakes appeared to be rather sedentary in their habits. The young were abundant in September but apparently did little or no feeding until the following spring. Exposure to the direct rays of the sun at 96° F. killed these snakes in about 45 min. They were observed in duck nests on many occasions; after an egg is swallowed it usually is broken in the neck of the snake by pressure. Stomach examinations of over 1,000 individuals disclosed that about half the food consists of small animals; eggs and young of birds made up the remainder. The two dominant items were meadow mice and duck eggs. The effect of 4 years' trapping was reflected in a reduction of the loss of nests attributable to bull snakes from 35 percent in 1938 to 18.5 percent in 1942.

Essai de corrélation sociologique entre les plantes supérieures et les poissons de la baignade du Lac Saint-Louis [Study of the sociological correlation between the higher plants and fish in the shallows of Lake St. Louis], P. DANSEREAU (*Rev. Canad. Biol.*, 4 (1945), No. 3, pp. 369-417, illus. 9; *Eng. abs.*, pp. 414-415).—The shallows of this lake near Montreal, Que., were studied during July-August, 1942, and the characteristics of the region are briefly outlined. A new classification of the life forms of the hydrophytes is offered and applied to a definition of three associations by means of quantitative biological spectra. The most constant organisms of each association are given and discussed in detail. The constancy diagrams for the plants and the fish in these associations showed the lack of a perfect dynamic coincidence of the plant and fish populations, but the high degree of constancy of certain species of fish indicated them to be genuinely correlated, provided their size be taken into consideration.

Enzyme activity as a factor in insect physiology and toxicology, H. HURST (*Nature* [London], 156 (1945), No. 3955, pp. 194-198).—This is a general account based on an investigation into the fundamental mode of action of insecticides and drugs. There are 13 references.

Heat injury in insects, G. T. JEFFERSON (*Nature* [London], 156 (1945), No. 3952, pp. 111-112).—A brief preliminary account is given of studies on heat injury to blowfly larvae (*Sarcophaga falcata* and *Calliphora erythrocephala*). With a sufficiently refined technic, fully grown larvae could be so injured by heat that although they recovered from heat dormancy and appeared normally active, death occurred within a few days. The probable mechanism of this injury is discussed.

Mode of entry of contact insecticides, W. H. POTTS and F. L. VANDERPLANK (*Nature [London]*, 156 (1945), No. 3952, p. 112).—Preliminary studies with tsetse flies (*Glossina* spp.) suggest that certain insecticides (DDT and pyrethrum used) need not necessarily be applied in such a way as to bring about either penetration of the general body cuticle on a large scale or entry into the spiracles, but that their action can be equally effective through contact of the feet alone, at any rate in species with well-developed pulvilli.

A comparison of the number of protoxylem strands with the rotenone content of derris roots, D. G. WHITE. (P. R. Fed. Expt. Sta.) (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 370-374, illus. 1).—This study was designed to show whether a relationship exists between the number of protoxylem strands in derris roots and the amount of rotenone deposited. The average numbers of such strands in roots of Sarawak Creeping, St. Croix, Changi No. 3 from Rio Piedras, and Clone 73 of Changi No. 3 proved to be varietal characteristics. Neither the rotenone content of individual roots or of varieties, the daily average rate of root elongation, nor the diameter of roots from manure plants could, however, be correlated with the number of protoxylem strands, nor were consistent differences in the numbers of these strands discovered in roots arising in the region of the basal node near the bud, opposite the bud, or from either side of stem cuttings.

Uses of DDT on pests of farm, home, C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 9, pp. 1, 8).—A practical account.

The use of DDT by civilians. (U. S. D. A.). (*Calif. Citrog.*, 30 (1945), No. 12, pp. 377, 388-390).—A somewhat condensed version of a recent statement from the U. S. D. A. Bureau of Entomology and Plant Quarantine.

Developments in the use of DDT for controlling insects (*Pests*, 13 (1945), No. 9, pp. 16-22).

Use of DDT in practical experiments and demonstrations, C. R. TWINN (*Pests*, 13 (1945), No. 9, pp. 6, 8).

Insecticidal action of D. D. T., J. R. BUSVINE (*Nature [London]*, 156 (1945), No. 3954, pp. 169-170).—The author concludes from data presented that as yet there seems to be insufficient information to formulate a theory of the action of DDT. Some attempts to support current hypotheses with quantitative data have met with no success. Of particular interest is the low toxicity of the ortho-para DDT and the fairly high toxicity of the dimethoxy compound. He believes it possible that the size and shape of the molecule have an important role.

Dipping screens with 5 percent DDT ([U. S.] *Off. Surg. Gen., U. S. Army Med. Dept. Bul.*, 4 (1945), No. 4, pp. 402-403).—A rapid method, reported by J. B. Belknap—involving use of a two-wheeled metal trailer—is described for dipping screens with DDT on a large scale.

D. D. T. as an insecticide—results of preliminary trials, N. C. LLOYD (*Agr. Gaz. N. S. Wales*, 56 (1945), No. 8, pp. 347-348).—Promising results were obtained against the potato tuber worm and *Nysius vinitor*.

The comparative antifouling efficacy of DDT, G. W. SEAGREN, M. H. SMITH, and G. H. YOUNG (*Science*, 102 (1945), No. 2652, pp. 425-426).—The authors conclude from their experimental results that DDT has a high order of specificity against the fouling of ships' bottoms by barnacles; against other fouling organisms it appeared to be inert. It thus seems unlikely that this toxicant can effectively displace copper and/or mercury pigments in the usual paints for ships' bottoms.

Sodium selenate, a new type of insecticide, J. E. HOWLAND. (Cornell Univ.). (*South. Florist and Nurseryman*, 58 (1945), No. 21, pp. 5-6).—A brief summary on the use of this poison for plants—such as ornamentals—which are not used as food and on soils not to be planted to food crops. Procedures and warnings are included.

The Neotropical genus *Syntermes* (Isoptera: Termitidae), A. E. EMERSON (*Bul. Amer. Mus. Nat. Hist.*, 83 (1945), Art. 7, pp. 431-471+, illus. 12).—This genus includes a number of large species of termites confined to the South American continent and generally recognized as the most primitive group of the subfamily Nasutitermitinae. This contribution attempts to bring the taxonomy of the genus up to date and to stimulate further collecting and ecological investigations. New taxonomy is involved, and a key to the species is included.

A note on synonymy in the genus *Gomphus* (Odonata), M. J. WESTFALL, JR. (Cornell Univ.). (*Ent. News*, 56 (1945), No. 8, pp. 200-202).

The grasshopper outbreak of 1944 in British Columbia, E. R. BUCKELL (*Canad. Ent.*, 77 (1945), No. 6, pp. 115-116).—A brief description of this worst and most widespread outbreak in the history of the Province, where the lesser migratory grasshopper was the predominating and almost the only species involved.

A revision of the North American species of the *Phasia* complex (Diptera: Tachinidae), A. R. BROOKS (*Sci. Agr.*, 25 (1945), No. 11, pp. 647-679, illus. 28).—A revision of this family of parasitic flies known to occur north of Mexico, including new taxonomy and a key to the genera.

New Canadian Diptera (Tachinidae), A. R. BROOKS (*Canad. Ent.*, 77 (1945), No. 5, pp. 78-96).—Included are descriptions of 25 new species and 2 new genera (*Eufrontina* and *Dolichotarsus*) of tachinid flies.

Two new species of Cecidomyiidae from Florida, O. A. JOHANNSEN. (Cornell Univ.). (*Fla. Ent.*, 28 (1945), No. 1, pp. 8-10).—Two new species of gall gnats are described.

The pit-making pittosporum scale, E. O. ESSIG. (Univ. Calif.). (*Calif. Dept. Agr. Bul.*, 34 (1945), No. 3, pp. 134-136, illus. 1).—The taxonomy and geographic distribution of *Asterolecanium arabidis* (Signoret) are discussed. This scale is regarded with considerable concern in parts of California because of its serious injuries to many valuable ornamental plants, to its rapid adaptation to an ever increasing number of unrelated plants, and to its correspondingly widening distribution. Like many others, this scale appears to inject a toxin into the host plant which inhibits growth and on many hosts causes various distortions. The plants most seriously injured appear to be *Pittosporum tobira* and privet. The present known host list is presented.

Insetos do Brasil: Lepidópteros, 1. parte [Insects of Brazil: Lepidoptera, pt. 1], A. DA COSTA LIMA (*Rio de Janeiro: Escola Nac. Agron.*, 1945, vol. 5, pp. 379, illus. 235).—This volume (E. S. R., 90, p. 77) considers the suborders Jugatae—superfamilies Micropterygoidea and Hepialoidea—and Frenatae—division Heterocera, including superfamilies Incurvarioidea, Nepticuloidea, Cossoidea, Castnioidea, Zygaenoidea, Tineoidea, Tortricioidea, and Pterophoroidea.

A new larvaevorid parasite of the social butterfly *Eucheira socialis* Westwood (Diptera), M. T. JAMES. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 10, pp. 328-330, illus. 1).—*Eucheirophaga lugubris* n. gen. and sp. is described.

"June" beetles and white grub control (North Dakota Sta. Bimo. Bul., 8 (1945) No. 1, pp. 19-20).—A review of a publication by Maheux and Gautier (E. S. R., 94, p. 88) based on studies conducted in Quebec, Canada.

The elaterid population of mid- and west Wales, J. R. E. JONES (*Zool. Soc. London Proc.*, 114 (1944), III, pp. 350-359, illus. 3).—This survey of the wireworm populations of grass and arable fields is based on the examination and identification of all the larvae and adults occurring in soil samples taken from 1,871 fields of the area. All species found are listed, together with some additional ones discovered by general collecting in the Aberystwyth district. The most important species were found to be *Agriotes obscurus*, *A. lineatus*, *A. sputator*, and *Corymbites cupreus*.

Moeurs des Bembex: Monographie biologique avec quelques considérations sur la variabilité des habitudes [The habits of Bembex: A bibliographical monograph, with some considerations on the variability in habits], E. T. NIELSEN (København (Copenhagen): Univ. Zool. Mus., 1945, pp. 174, illus. 57).—This monograph on the sphecoid wasps—particularly *B. rostrata* L.—considers the adults, their development, colonies, nests, and prey, and their parasites and enemies, with a brief note on an American species *Stizus uncinatus* Say, and concluding general remarks. An eight-page bibliography is provided.

The black beetle, *Heteronychus sanctae-helenae*, as it affects coastal vegetable growers and horticulturists, C. R. WALLACE (*Agr. Gaz. N. S. Wales*, 56 (1945), No. 8, pp. 339-342, 348, illus. 1).—This scarab beetle of South African origin is reported to have been a major pest in coastal New South Wales since 1930. Although the dairy industry has been injured most—chiefly because of the destruction of corn raised for stock feed, growers of truck vegetables, cut flowers, and miscellaneous crops have also suffered heavy annual losses from its depredations. Preventive and remedial measures are discussed.

An investigation into the life-history and morphology of the mustard beetle, *Phaedon cochleariae* F., on watercress, G. G. HAMNETT (*Zool. Soc. London Proc.*, 114 (1944), III, pp. 368-381, illus. 6).—This study—undertaken during field experiments on the control of this beetle in cultivated watercress beds—includes a brief review of previous work (19 references) and detailed findings on the life cycle of the pest as it occurs on this host plant, its hibernation habits, and the duration of the various larval and pupal stages. Only two annual generations of adults have been described previously, but in the present work it was demonstrated that actually there are three. In addition, a detailed study was made of both the external and internal anatomy of all stages of the life cycle.

Sabadilla, an insecticide to control the squash bug, M. D. WALLACE (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), p. 284).—Experimental evidence would seem to indicate that sabadilla applied well around all vines will give excellent control; it also appeared to have residual properties, since migrating squash bugs entering the field avoided the treated plots. For this insect, 20 to 40 percent of activated material gave satisfactory control.

The action of a repellent spray against the Mexican fruitfly, D. F. STARR. (U. S. D. A.) (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 9, 415-422).—Previous studies with repellent sprays for Mexican fruitfly control in Mexico had shown that traps in sprayed trees sometimes yielded more flies than similar traps in non-sprayed trees, although the repellent appeared to provide protection for the fruit. In an effort to test this apparent contradiction, traps containing a fruitfly lure were set in two mango trees, and one tree was sprayed about once each week from late March to late June while no spray was applied to the other tree. Flies caught in the traps were counted before each spraying and at intervals after spraying. The ratio of the counts in the two trees were analyzed statistically. Repellent action passed through a negative phase following application of the repellent, during which the catch in the sprayed trees was less than in the nonsprayed tree, and a positive phase in which the catch in the sprayed tree was above normal.

Trials conducted when the catches had returned to equilibrium after an application indicated that the differences were due to the action of the repellent rather than to natural variation. Comparisons of infestations in fruits from the sprayed and nonsprayed tree demonstrated that the spray probably provided some protection to the fruit.

New insecticides for codling moth control, B. A. PORTER. (U. S. D. A.) (*Md. State Hort. Soc. Proc.*, 47 (1945), pp. 10-15).—Though insufficient to explain the marked increases developed in the ability of the codling moth to thrive in the

presence of heavy deposits of lead arsenate, some factors that may be concerned are summarized. It is obvious that there is a definite need for a more effective poison. Various materials tested over a period of years are discussed, including DDT about which final judgment cannot be made until the effect accumulations in the soil may have on trees and cover crops is known. Much work remains to be done with the formulation of DDT for use in spraying; different mixtures have been used by various workers, but no standard mixture has yet been formulated. The general conclusion is that "Maryland growers would do well to plan on continuing the use of lead arsenate, supplemented in some cases by nicotine and oil" for the present.

Codling moth control by DDT sprays at Cordova, Maryland, in 1944, C. GRAHAM. (Univ. Md.). (*Md. State Hort. Soc. Proc.*, 47 (1945), pp. 15-19).—From these tests it appeared that DDT (Gesarol AK 20) in all strengths and combinations used except the 0.5 lb. dosage controlled as well as or better than the standard sprays employed as controls. Where used at 1 lb. to 100 gal., the percentage of clean fruit was about the same regardless of size of crop; this is not true for the standard schedules.

El DDT y sus posibilidades en el control de la *Carpocapsa pomonella* [DDT and its possibilities for controlling *C. pomonella* L.], G. ROSENBERG ([Chile] *Agr. Téc.*, 5 (1945), No. 1, pp. 65-69; *Eng. abs.*, p. 69).—Small field tests in Chile showed the possibilities of DDT for codling moth control; it may also control various species of leafhoppers attacking apples. No injury to the trees was observed.

Three methods of treatment control peach tree borer, C. LYLE (*Miss. Farm Res.* [Mississippi Sta.], 8 (1945), No. 9, p. 8).—A practical account.

Amphorophora aphids notes, G. F. KNOWLTON. (Utah Expt. Sta.). (*Ent. News*, 56 (1945), No. 8, pp. 206-209).—*A. fronki* n. sp. is described from currant foliage, and host and locality data are presented for additional species, a number of which were collected from berry plants.

A revision of *Parlatoria* and closely allied genera (Homoptera: Coccoidea: Diaspididae), H. L. MCKENZIE. (U. S. D. A.) (*Microentomology*, 10 (1945), No. 2, pp. 47-121, illus. 34).—This contribution, the foreword to which is by H. M. Armistage, is presented in a form which has a direct bearing on the biological aspects of a group of insects of major economic importance to citrus and deciduous fruit growers in California and therefore closely associated with any programs looking toward their control. It not only discusses species now present in the State but gives information on the occurrence and distribution of equally important related species in other parts of the world, making possible the maintenance of adequate quarantine safeguards against their introduction. The contribution also suggests a direct avenue of approach in determining the areas which might profitably be searched for natural enemies of some members of the group, particularly the olive scale *Parlatoria oleae* (Colvée), which is already assuming importance over a wide range of hosts in California.

Our knowledge of the insect and mite pests of citrus in India and their control, H. S. PRUTHI and M. S. MANI (*Imp. Council Agr. Res. [India], Sci. Monog.* 16 (1945), pp. 42+, illus. 28).—This monograph aims to present all available information on the insect and mite pests of citrus in India, with a copious bibliography.

Bionomics of the rose seed chalcid *Megastigmus nigrovariegatus* Ashm. (Hymenoptera: Callimomidae), W. V. BALDUF. (Univ. Ill.). (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 7, pp. 185-198).—The history and geographic distribution are given. The deposited egg, the larva, and the pupa inhabit the seed or the seed cavity in the rose hip after the seed has been consumed by the larva. So far as known, this chalcid inhabits the achenes of no other plants than wild and cultivated forms of the genus *Rosa*, though extensive variations exist in their suitability as hosts. The

seasonal development and activities of the insect are described, and its enemies are briefly discussed.

Stem borers and twig girdlers affecting roses, E. I. MCDANIEL. (Mich. State Col.). (*Amer. Rose Ann.*, 1945, pp. 151-154).—The following species and their control are briefly considered: The rose stem girdler (*Agrilus communis rubicola* Perrin), red-necked cane borer, and raspberry cane borer.

A new host for the acorn weevil *Curculio rectus* Say (*Balaninus* Germ.), A. H. MACANDREWS (*Amer. Rose Ann.*, 1945, p. 167, illus. 1).—The chestnut weevil is reported attacking rosebuds.

Effect of site and the locust borer on plantations of black locust in the Duke Forest, F. H. BERRY. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 10, pp. 751-754).—The data from this planting reveal that in the area concerned black locust can be grown to merchantable size only on the better sites. The trees are most susceptible to borer attack when 1 to 5 in. d. b. h.; over this diameter they will probably recover from borer attacks. Site and degree of infestation were found directly related; slow-growing trees were seldom able to overcome the effects of heavy attacks, whereas fast-growing trees were usually able to recover. There appears to be a definite relationship between tree vigor and amount of injury by the locust borer. Plantations of black locust near old brood trees are more heavily infested than those at a considerable distance. The shipmast variety proved no more resistant to injury than the ordinary form. Certain silvicultural practices, such as planting in mixtures or coppicing, failed materially to lessen damage by the borer.

Biology of *Anobium punctatum*—progress report, J. M. KELSEY, D. SPILLER, and R. W. DENNE (*New Zeal. Jour. Sci. and Technol.*, 27 (1945), No. 1, Sect. B, pp. 59-68, illus. 3).—Following a brief review of the literature (13 references), this report describes the technics used in rearing these borers for utilization in testing timber therapeutics. Certain aspects of their biology not previously dealt with are also considered.

Phenol as a termite repellent, G. N. WOLCOTT. (P. R. Univ. Expt. Sta.). (*Pests*, 13 (1945), No. 9, p. 26).—Experiments in the prevention of attacks by *Cryptotermes brevis* (Walker) on most susceptible woods are reported to indicate the value of heavily chlorinated or brominated compounds of phenol.

The mortality of the immature stages of *Calandra oryzae* L. (small strain) and *Rhizopertha dominica* Fab. in wheat of different moisture contents, L. C. BIRCH (*Austral. Jour. Expt. Biol. and Med. Sci.*, 23 (1945), No. 2, pp. 141-145, illus. 2).—These two grain pests were reared from egg to adult at different temperatures in wheat of differing moisture contents, and the mortality of the immature stages was recorded. The maximum temperatures for any survival were 38.6° C. for the lesser grain borer and 34° for the rice weevil; the minimums were 22° and 15.2°, and the driest grain in which there was any survival was 9 and 10.5 percent, respectively. The relation between temperature, moisture, and mortality is represented on three-dimensional graphs. For both insects there was an interaction of temperature and moisture content in their effect on mortality; that of the borer was uniformly low in grain of 12 and 14 percent moisture at 26°-34°; at temperatures outside this range and in drier wheat the mortality was significantly higher. At 9 percent moisture mortality was over 95 percent in sound and over 60 percent in damaged grain. The moisture content of the driest grain in which this borer developed fell as the temperature increased from 18.2° to 34° and rose with increase from 34° upward. The higher survival of the borer in damaged grain was due to the greater facility with which first stage larvae could enter the grain and become established. The mortality of the rice weevil increased rapidly as the moisture fell below 14 percent; it was lowest at 30° at all moisture contents and increased at temperatures greater or less than 30°. The moisture content of the driest grain in which there

was any survival of the weevil was higher as the temperature increased above 30° or decreased below 18.2°. Practically all the mortality of immature stages occurred in the first stage larvae. In wheat at 14 percent moisture—the most favorable level for both species—the mortality of the borer was higher than that of the weevil within their respective medium ranges of temperature. The difference between the mortality of the borer at 14 percent and lower moisture contents was, however, less than the corresponding difference for the weevil. Previous work by the author regarding the effects of dryness on these two insects has been noted (E. S. R., 93, p. 171).

Life tables for the black flour beetle *Tribolium madens* Charp., T. PARK (*Amer. Nat.*, 79 (1945), No 784, pp. 436-444, illus. 1).—The author presents life tables for both ♂ and ♀ beetles of this species, which lives in regularly renewed flour-yeast medium under favorable laboratory conditions. These mortality data are discussed and compared with those collected earlier for the confused flour beetle (E. S. R., 84, p. 793); the latter along with the red flour beetle are appropriate and much studied organisms for analyzing experimental population problems. It is hoped that *T. madens* will also prove helpful in this connection; the object of this study is to place on record certain basic observations which can be used in later investigations.

The fumigation of California dates with methyl bromide, H. M. ARMITAGE and J. B. STEINWEDEN. (U. S. D. A.). (*Calif. Dept. Agr. Bul.*, 34 (1945), No. 3, pp. 101-107, illus. 1).—During 1944-45 a number of cases of methyl bromide poisoning were reported among employees in packing houses and processing plants where this fumigant had been used against the dried-fruit beetle. From experiments here reported it is concluded that the recommended schedule of 1 lb. methyl bromide per 1,000 cu. ft. for 24 hr. at 60° F. or above did not impart a disagreeable flavor to Deglet Noor dates or leave an appreciable amount of bromine residue; if used as recommended it should not be deleterious to either product or consumer. It is believed improbable that enough of the chemical is left in fumigated dates to be injurious, but where overexposures are used there is danger of imparting an off-flavor. If, however, the dates are protected from reinfestation by being left in a closed fumigation chamber, the gas should be exhausted from it at the end of 24 hr and not left there longer to be taken up by the dates.

Notes on the life history of *Periplaneta fuliginosa* Serv., P. RAU (*Psyche*, 52 (1945), No. 1-2, pp. 107-108).—Three adult ♀♀ in a lot of the American cockroach from New Orleans, La., were identified as *P. fuliginosa*; this is a brief note on them and their offspring. This species has been recorded from the United States only in the South, where it is said to be common in storehouses, docks, etc. It is believed to be an adventive in America from the Old World.

Control and elimination of pest infestations in public water supplies, M. E. FLENTJE (*Jour. Amer. Water Works Assoc.*, 37 (1945), No. 11, pp. 1194-1203, illus. 1).—The author reviews (19 references) the problem of controlling such pests as midge fly larvae and Crustacea and reports on the use of DDT and other measures that have proved successful.

Predaceous diving beetles in Winnipeg's water supply, W. D. HURST (*Jour. Amer. Water Works Assoc.*, 37 (1945), No. 11, pp. 1204-1206).—The tentative conclusions were that the beetles—predominantly *Dytiscus* spp.—had flown in mainly from the surrounding countryside, that cleaning the reservoirs was only a temporary solution, that in the absence of filtration a self-cleansing screen would eliminate the trouble, that ordinary chemical means are not effective, and that the phenomenon appears to be cyclic—having occurred in this situation during only 2 out of 25 yr.

The occurrence of *Culex* (Melanoconion) elevator Dyar and Knab in Florida, with keys to the Melanoconions of the United States (Diptera: Culicidae), W. W. WIRTH (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 7, pp. 199-210, illus. 30).—

This mosquito is reported for the first time in the United States, and a brief description of its habitat is given. The finding of larvae of *C. atratus* Theob. is also reported from Florida, this constituting the first breeding record for the species in the United States. The eight species of *Culex* (*Melanocnion*) now known from this country—with their geographical record—are listed. Keys are given to separate the ♂♂ by genitalia and the larvae (except *C. anips*—larva unknown).

Records of *Culex* (*Barraudius*) *modestus* Ficalbi (Diptera: Culicidae) obtained in the south of England, J. F. MARSHALL (*Nature* [London], 156 (1945), No. 3954, pp. 172-173).

Long-range dispersal of *Anopheles quadrimaculatus*, D. E. EYLES, C. W. SABROSKY, and J. C. RUSSELL (*Pub. Health Rpts.* [U. S.], 60 (1945), No. 43, pp. 1265-1273, illus. 3).—Studies in the Santee Reservoir area in South Carolina indicated ♀♀ of the common malaria mosquito to be capable of long flight, since 20 of 3,500 marked individuals released were recaptured 2 to 2.7 miles from the point of liberation and a single one at 3.63 miles. The central flooded swamp of thousands of acres is a source of large numbers of this mosquito; under these conditions it appears that flight in significant numbers occurs to distances well beyond those considered usual for the species. Two factors are believed principally contributive to these long flights, viz, the heavy breeding over vast areas and the lack of domestic blood sources between the flooded swamp and the stations of recapture. It is pointed out that the flights here reported are not comparable with the long hibernation flights described for *A. freebornii* and several foreign anophelines, nor do they mean that *quadrimaculatus* will necessarily fly in dangerous numbers beyond the commonly applied 1-mile limit of control. The findings do, however, point to the desirability of individually evaluating each area for which mosquito control is proposed.

DDT residual house spray—a method of malaria control in rural areas, F. L. KNOWLES and C. S. SMITH (*Pub. Health Rpts.* [U. S.], 60 (1945), No. 43, pp. 1274-1279).—The materials, methods, and equipment employed in spraying 513 rural houses are described. Analysis of the results indicated that each treated house averaged 0.82 gal. of spray and 0.73 man-hour at a total cost of 74 ct. per house. The number of resting mosquitoes in unsprayed as compared with sprayed houses was reduced 94, 81, and 66 percent for the 5-, 2.5-, and 1-percent DDT sprays, respectively, over the 2-mo. period following application.

Some compounds containing the 3,4-methylenedioxyphenyl group and their toxicities toward houseflies, M. E. SYNERHOLM and A. HARTZELL (*Contrib. Boyce Thompson Inst.*, 14 (1945), No. 2, pp. 79-89).—The condensation product between piperonal and benzyl cyanide was tested and found active as a toxicant toward houseflies when used as a synergist with pyrethrins. Four substituted amides of α -phenyl- β -3,4-methylenedioxyphenylacrylic acid were prepared which possessed activity as housefly insecticides when used with pyrethrins. The N-cyclohexyl amide and piperidide—the only ones tested without pyrethrins—themselves exhibited a marked paralyzing action. Four substituted amides of α -cyano- β -3,4-methylenedioxyphenylacrylic acid were synthesized and shown to act as housefly toxicants; used alone, the piperidide appeared to have a moderate paralyzing action. Of the amides tested, the N-cyclohexyl amides were the most toxic. Two previously unreported amides of α -phenyl- β -3,4-methylenedioxyphenylacrylic acid and four new amides of α -cyano- β -3,4-methylenedioxyphenylacrylic acid are reported, with their melting points and analyses. The condensation products obtained from isosafrole and maleic esters were found effective against houseflies as synergists with pyrethrins or by their own paralytic action when used alone in "Deo-base." The effectiveness of the crude reaction mixture obtained from tetrahydrofurfuryl maleate and isosafrole proved to be at least as great as that of a product partially purified by petroleum

ether extraction. Piperonaldoximino- β -cyanoethyl ether was prepared and shown to be toxic toward houseflies.

Dragonflies predaceous on the stablefly (*Stomoxys calcitrans* (L.)), M. WRIGHT. (U. S. D. A.). (*Fla. Ent.*, 28 (1945), No. 1, pp. 11-13).—Sporadic appearances of swarms of dragonflies along the Florida beaches are reported, and they were observed to capture and eat large numbers of the stablefly. From the data presented it is believed that these swarming dragonflies represent a definite migration for the purpose of obtaining food.

The use of D. D. T. against sheep keds, G. B. S. HEATH (*Vet. Jour.*, 101 (1945), No. 8, p. 180).—Dipping the animals in DDT at a concentration of 0.5 percent rendered the fleece lethal to the sheep tick for not less than 36 days; lower concentrations and longer intervals were not tried.

The effect of temperature on the sex ratio of *Xenopsylla cheopis* recovered from live rats, L. C. COLE (*Pub. Health Rpts.* [U. S.], 60 (1945), No. 45, pp. 1337-1342).—Though it is believed probable that the two sexes of the oriental rat flea occur in about equal numbers in nature, there was a highly significant tendency in all four cities investigated for the $\delta \delta$ to outnumber the $\eta \eta$ on days with a high mean temperature and for the $\eta \eta$ to predominate on cold days. This response appeared to require less than 24 hr. and is thought to have resulted from more frequent feeding by the $\delta \delta$ than by the $\eta \eta$ in hot weather and less frequent feeding by the $\delta \delta$ in cold weather. Since in the San Diego, Calif., survey equal numbers of the sexes were attained at a lower temperature than in the other cities, it seems apparent that mean daily temperature is not the only factor influencing the sex ratio. The number of δ fleas on the rats was apparently affected more by temperature than that of the η . Previous studies (14 references) have revealed that both sexes must feed more frequently under the adverse high temperatures in order to survive. Thus the proportion of the total flea population found on the hosts would presumably be somewhat increased by high temperatures. The number of η , however, was found to change less than that of the δ .

Life cycle and care of the chicken mite (*Dermanyssus galinae*) in the laboratory, C. L. WISSEMAN, JR., and S. E. SULKIN (*Jour. Bact.*, 50 (1945), No. 1, p. 128).

The value of DDT for the control of the common chicken louse, D. C. WARREN. (Kans. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 473-476).—In the experiments reported, DDT in concentrations up to 10 percent and in the form used (Gesamol A3) failed to give the chicken any better protection than that provided by the standard sodium fluoride; a 3-percent concentration was less effective than the latter. The DDT failed to protect the bird from reinfestation after 2 to 3 weeks, which is the approximate life cycle of the chicken body louse. Where all birds of the flock were treated, both 3 percent DDT and sodium fluoride appeared to give fairly effective control of the lice.

Honey production and wintering in Alberta, R. E. ENGLISH (*Gleanings Bee Cult.*, 73 (1945), No. 10, pp. 409-411, 440, illus. 3).—A general account of apiculture in this Canadian province, including the problems of overwintering.

ANIMAL PRODUCTION

The nutritive value of mixed proteins: The biological value of the proteins of a mixture of yellow maize seed and grape seeds, and a mixture of yellow maize seed and camelthorn pods (*Acacia giraffae*), S. J. MYBURGH (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 20 (1945), No. 2, pp. 213-222).—In tests with rats, the biological value of 58.6 percent for yellow corn alone dropped to 47.6 and 50.3 percent for mixtures of corn and camelthorn pods. The nutritive value of a mixture of 1 part of pods to 3 of corn was slightly higher than that for corn alone, but the lower

true digestibility of the mixture resulted in a lower net utilization of the nitrogen. A mixture of grape seeds and corn was superior to a mixture of cameltorn pods with corn. The studies in digestibility and nitrogen utilization were conducted with six rats on the different rations.

Commercial feeding stuffs—report on inspection, 1944, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul. 486 (1945), pp. 165-260*).—The usual report (E. S. R., 92, p. 549) of the guaranteed and found analyses of 1,035 brands of feeding stuffs and 23 brands of vitamin D carriers registered in 1944.

Commercial feeding stuffs, 1944-45, E. R. TOBEY (*Maine Sta. Off. Insp. 196 (1945), pp. 31*).—The guaranteed and found analyses are reported of 515 samples of feeds officially examined in connection with the enforcement of the Maine feeding stuffs law (E. S. R., 92, p. 252).

Inspection of feeds, J. J. HAVERN and C. H. STETSON, JR. (*Rhode Island Sta. Ann. Feed and Fert. Cir., 1945, pp. 5-7, 12-44*).—The guaranteed and found analyses of 430 samples of feeds officially examined in Rhode Island in 1944 in connection with the feed law are presented (E. S. R., 90, p. 384).

Fattening Good and Common grade steers in southeastern Coastal Plains, W. H. BLACK and B. L. SOUTHWELL. (Coop. Ga. Coastal Plain Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 904 (1945), pp. 13, illus. 5*).—Continuing studies of the use of various feeds for steers in the southeastern Coastal Plains, comparison was made between the feeding of 30 Good grade and 30 Common grade 2-year-old steers in each of 3 yr., 1939-41. All three experiments, lasting 84 and 140 days each, were conducted on rations of ground snap corn, cottonseed meal, and peanut hay. Feed consumption, weights, returns per steer, carcass grade, and dressing percentages were ascertained after the two feeding periods. The Good steers made significantly greater gains than the Common steers each year, the average differences being 52 lb. in the 84- and 74.6 lb. per head in the 140-day fattening periods, respectively. The higher grade steers gained more rapidly and kept on gaining longer than the Common steers. The Common steers required more feed per 100 lb. gain than the Good steers in each of the 3 yr., the differences ranging from 6.7 to 33 percent, with an average of 18 percent. The average cost for the gains of Good steers was \$1.49 less per 100 lb., and the returns \$1.42 more, than those of Common steers. In the 140-day feeding period, Common steers consumed an average of 6.3 percent more feed per 100 pounds of gain, even though in one year they required 3.3 percent less feed. The Good steers on the average graded Good in carcass, which was one full grade higher than the carcasses of the Common grade steers. The results from the longer feeding period of 140 days showed that the Good grade steers continued to make a profit and showed benefits from the extra feeding longer than the Common steers were able to do. The average gain of Good and Common steers fed for the longer period was 23 lb. A greater difference was noted between the sales price of Good and Common steers at 140 days than at the end of 84 days, showing clearly that as the feeding period advanced there was a greater tendency to fatten on the part of the Good steers. On the whole it was indicated that Common steers may be suitable for fattening periods of about 3 mo., but for periods of 5 mo. less satisfactory than Good cattle.

The absorptivity for solar radiation of different coloured hairy coats of cattle, G. RIEMERSCHMID and J. S. ELDER (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 20 (1945), No. 2, pp. 223-234, illus. 7*).—The mean effective absorptivity of solar radiation on 10 hides of several breeds of cattle was studied, somewhat in accord with methods employed in a previous study (E. S. R., 91, p. 578). Under South African conditions, this absorptivity was 49 percent for a white Zulu (a breed indigenous to Zululand and Swaziland), 78 percent for a red Africander, and 89 percent for a black Aberdeen Angus. Direction of the hair did not affect absorption

more than 4 percent. There was no difference in the absorptivity of autumn and winter coats of two Africanders. The absorptivity of the Sussex winter coat was not more than 2 percent higher than that of the summer coat. There was no appreciable difference in the absorptivity of the coat standing or brushed down. After clipping a long-haired winter coat to about $\frac{1}{2}$ in. in length, the mean absorptivity was 2 percent lower than the unclipped curly hair, probably due to a slightly lighter color of the clipped coat. The mean effective absorptivity of the hair coats of different shades of red and grades of smoothness ranged from 78 to 83 percent. Color was the most important factor affecting absorptivity.

The carotene content of sheep blood, T. M. PAULSEN, R. J. HILMOE, and A. L. MOXON. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 24 (1944), pp. 81-84).—The plasma carotene content of the blood of 14 ewes, 3 wethers, 5 rams, 1 antelope, and 1 deer on different rations is given. Considering the magnitude and fluctuation of the values and other facts, one might conclude that there is little if any significance between the intake of carotene and the amount of carotene and vitamin A in the blood stream. Consequently, blood plasma carotene levels of sheep cannot be used as an index of carotene intake.

Lambs need alfalfa hay to gain top finish (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1945), No. 1, p. 13).—Comparisons were made of alfalfa hay with prairie hay, upland prairie hay, corn silage, and oat straw with or without soybean meal fed singly or in combination with roughages. When alfalfa was fed, especially with 0.2 lb. of soybean meal per day added to shelled corn, the lambs averaging 70 lb. were ready for marketing at the end of a 98-day feeding period. Good gains were made when good quality upland prairie hay or upland prairie hay and corn silage were fed as the roughage with 0.2 lb. of soybean meal per day. Possible calcium and phosphorus deficiency was avoided by feeding bone meal, but the gains were less than with alfalfa hay fed as the roughage. The gains were slow with oat straw or corn silage fed alone or in combination, and the lambs were difficult to keep on feed. Even though fed 141 days they did not reach market finish.

The effects of glucose, fructose, and galactose on the respiratory exchange of the goat, E. G. RITZMAN and T. M. CARPENTER. (Univ. N. H. et al.). (*Jour. Nutr.*, 28 (1944), No. 2, pp. 71-79).—In pursuance of general studies with the Nutrition Research Laboratory of the Carnegie Institution of variations in the effects of hexoses on the respiratory exchanges of animals of different species (E. S. R., 76, p. 520), results were reported of studies with four ♂ and five ♀ adult goats 40 hr. after withdrawal of food. Observations were made in three to six $\frac{1}{2}$ -hr. successive periods when water alone or when 250 cc. of water at 37° to 38° C. or 25 gm. of the hexoses dissolved in 125 cc. of water was administered. A slight but delayed increase in respiratory quotient was produced by water alone. Fructose caused the greatest increase in R. Q. and the metabolism of carbohydrates. The least effects were produced by galactose, with glucose giving an intermediate response for the three sugars. The results indicate a slight amount of fermentation after injection of galactose and fructose.

Mortality in young pigs.—I, Effect of diet from birth to weaning and from weaning to maturity, R. GWATKIN (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 10, pp. 263-281).—The experiments involved five groups of two sows each which were fed their respective rations continuously in dry lot from weaning age to the end of the experiment, while the pigs from each received the same ration as their dams. The experimental rations were (1) grain and salt; (2) the same as (1), plus ground limestone; (3) the same as (2), plus tankage; (4) the same as (3), plus feeding oil; and (5) the same as (4), plus iron sulfate. Detailed case histories are presented for each of the eight litters of pigs produced (one sow each in groups 2 and 4 failed to produce litters).

The small number of animals in each group and wide variations in response of groups on the same ration prevented the drawing of definite conclusions. No apparent benefits were derived from tankage as a supplement to grain and minerals, either in survival or rate of gain of pigs. The addition of feeding oil to the grain-tankage rations markedly improved both survival and rate of gain. The effect of iron supplement was reflected mainly in better survival to weaning age.

Nutritive value of cull peas for fattening hogs, W. M. BEESON and C. W. HICKMAN (*Idaho Sta. Cir. 106 (1945), pp. [4]*).—Four lots of 10 purebred Duroc Jersey and Poland China pigs averaging 58 lb. in live weight were self fed free choice for 105 days until market weight of 200–220 lb. was obtained on rations of 50, 66⅔, 80, and 100 percent wheat. The average daily gains were, respectively, 1.38, 1.46, 1.55, and 1.32 lb. Peas, which made up the balance of these rations, were an economical and practical feed for fattening hogs. A protein supplement of meat meal, linseed meal, ground alfalfa, bone meal, and salt was fed to all lots.

The value of a supplemental mixture fed with cereal grain, J. H. LONGWELL and W. H. HUBER (*North Dakota Sta. Bimo. Bul., 8 (1945), No. 1, pp. 23–27, illus. 3*).—In a 126-day feeding trial at the Williston Substation, 3 groups of 10 pigs each, averaging about 25 lb. in weight, were fed on wheat alone; wheat and a supplement, to supply protein, vitamins, and minerals; and barley with the same supplement. The lot on wheat alone made very slow average daily gains, the average daily gain being 0.3 lb. as compared with 0.83 and 0.97 lb., respectively, on the wheat and barley with supplements. In a second part of the test covering 136 days, a supplement was fed with these grains and immediately the condition and gains of all improved. Although those on wheat alone lost money, the pigs on wheat with its supplement in the first part of the trial made \$1.77 per head and those on barley with the supplements made an average of \$1.90 per head, exemplifying the benefits from a balanced ration.

The National Poultry Improvement Plan (*U. S. Dept. Agr., Misc. Pub. 300, rev. (1945), pp. 26, illus. 8*).—A revision (E. S. R., 88, p. 669).

How long should a chicken live? F. E. MUSSEHL (*[Nebraska Sta. Cir.] 77–1 (1944), pp. 3*).—This depends on many conditions any one of which may be the determining factor.

Floor space requirements of broilers, A. E. TOMHAVE and K. C. SEEGER (*Delaware Sta. Bul. 255 (1945), pp. 22, illus. 4*).—Differences in the numbers of chicks brooded in 20- by 30-ft. pens were used for a comparison of the gains made and mortality of chicks at the Georgetown Substation. The average number of chicks per stove (each pen containing two stoves) ranged from 400 to 500 and in some cases up to 600 chicks. The breeding of these birds was Barred Plymouth Rock ♂ ♂ × New Hampshire ♀ ♀ in the two experiments, each of which lasted 13 weeks. As the number of chicks per pen decreased, the average weight of the broilers at the completion of the 13-week period increased. A direct relationship was found between the percentage of broilers weighing 3 lb. and over and the floor space allowed per bird. The feed consumption decreased as the number of broilers per pen increased, but the feed required per pound was not influenced by the birds per pen. Total mortality and losses from coccidiosis were heavier when the numbers of birds were increased, and the costs per broiler were greater with the larger numbers. Considering all factors concerned with broiler production, it was concluded that broilers should be allowed at least 0.6 sq. ft. per bird.

The effect of feeding diethylstilbestrol to cockerels, J. F. SYKES, J. A. DAVIDSON, and F. N. BARRETT. (*Mich. Expt. Sta.*). (*Poultry Sci., 24 (1945), No. 6, pp. 542–545*).—In further study of the effect of diethylstilbestrol on fattening cockerels, as was made by Lorenz (E. S. R., 89, p. 245), three groups of birds were selected. One group consisted of 60 Rhode Island Red cockerels 12 weeks of age,

a second group of 27 Barred Plymouth Rock cockerels 9 weeks of age, and a third group of 27 Barred Plymouth Rock chicks 5 weeks of age. The Rhode Island Reds were divided into five groups at 12 weeks, two of which were killed at 24 weeks of age and three at 16 weeks of age. Two of these received stilbestrol with bile salts, whereas another received stilbestrol only. The 27 Barred Plymouth Rock chicks of the two ages were divided into three groups, with one group of controls, one receiving stilbestrol only, and a group in each case receiving stilbestrol and bile salts. Consumption of diethylstilbestrol from 0.70 to 1.55 mg. per pound of feed improved the market grade and the rate of gain of many of the experimental lots. A definite antigonad effect was also observed. There appeared to be no advantage in continuing the feeding period beyond 6 weeks. The age of the birds when feeding was started had no noticeable effect on the influence of stilbestrol. Additions of bile salts had no effect on its utilization.

Fattening chickens by feeding estrogens, R. H. THAYER, R. G. JAAP, and R. PENQUITE. (Okla. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 6, pp. 483-495).—Inclusion of estrogens (diethylstilbestrol and dianisylhexene) in the fattening rations was studied with 1,141 growing chickens of both sexes and 60 mature ♂♂. The addition of the estrogens to the feed caused fat to be rapidly deposited in the body. There was superiority in the skin texture and distribution of the fat ordinarily observed in birds of similar age and sex. The estrogens were more potent in oil solution mixed with the feed than when fed in tablet form. A more favorable fattening with the estrogens was accompanied by a slight increase in feed consumption. Estrogen feeding suppressed maleness, and most of the body changes associated with egg production in the ♀ were produced in both sexes as a result of this feeding. The dimethyl ether of diethylstilbestrol (3,4-dianisylhexene-3) proved more efficient for fattening than the original estrogen product. The levels of the estrogens used for fattening were 0, 20, 40, 60, 80, and 100 mg. of dianisylhexene per pound of feed. The optimum level of estrogens for a 3-4-week fattening period was about 40-50 mg. per pound of feed. There was much improvement in fatness when the fattening period was reduced to 2 weeks. Growth rate was unaffected by estrogen feeding. Excessive doses of dianisylhexene produced physical disability due to lipemia and, in a few instances, death. Fragile leg and wing bones were noted in some chicks fattened with this material.

Phosphorus in poultry nutrition.—I, The relation between phytin and different sources of vitamin D, E. P. SINGSEN and H. H. MITCHELL. ([Conn.] Storrs Expt. Sta., and Univ. Ill.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 479-480).—Variations were encountered in the bone ash of chicks on rations differing only in the sources of vitamin supplied in one case by cod-liver oil and in another by irradiated animal sterols (Delsterol) of equal A. O. A. C. chick potencies. It was calculated that 40, 80, and 160 A. O. A. C. units of vitamin D from irradiated sterols are equal to 56.5, 116.5, and 183.2 units of vitamin D from cod-liver oil, and thus concluded that vitamin D from irradiated sterols were 1.34 times as effective as that from cod-liver oil in chicks, relying on phytin as the principal source of phosphorus. Some antirachitic product may be present in small amounts but in greater concentration in the irradiated animal sterols than in cod-liver oil. It may be that some product in irradiated sterol is more specifically concerned with the utilization of phytin phosphorus rather than inorganic phosphorus. The possibility of factors inhibiting antirachitic action in cod-liver oil or differences in the destruction of these products is suggested.

The combined slope in comparative tests of tibia and toe ash in the chick assay for vitamin D, C. I. BLISS. (Conn. [New Haven] Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 6, pp. 534-541, illus. 4).—Routine assays for vitamin D were calculated for 11 groups of from 14 to 19 chickens each. A significant curvature from a straight line was shown with tibia ash in the 3 groups, but none differed from linearity in

terms of toe ash, the dosage being measured in logarithms. Curves from the separate experiments were parallel with both criteria within the experimental error. The same biological factor was measured by both tibia and toe ash, but the ratio of the standard deviation to the slope for toes was somewhat less than that for tibia. In 100 tests of unknown oils the D potency determined by toe ash and tibia ash differed by about 12 percent, those computed with combined slopes being in somewhat closer agreement than those from individual slopes.

Chick feeding trials demonstrate importance of a balanced ration, J. E. PARKER and J. E. COOK (*North Dakota Sta. Bimo. Bul.*, 8 (1945), No 1, pp 9-13, illus. 2).—The continued feeding of chicks on an adequate ration is necessary for satisfactory growth and normal bone development. If growth is retarded due to a lack of protein, vitamins, and minerals, the study demonstrated that the chicks will make rapid gains when given a balanced ration. Crooked breast bones cannot be corrected by later feeding a balanced ration. Groups of White-Leghorn chicks were fed to 11 weeks of age on balanced mash and an all-grain mash, and less feed was consumed per pound of gain in the former than in the latter case.

The optimum protein level for chickens as influenced by sex, V. G. HELLER and R. PENQUITE (Okla. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 465-468, illus. 1).—A cereal mix and a protein mixture with a vitamin-mineral mix were combined in proportion to furnish from 12.4 to 40 percent protein to lots of 25 ♂ and ♀ chicks of the New Hampshire, White Leghorn, and Oklabar breeds fed at different seasons to about 8 weeks of age. The weights and gains were recorded at weekly intervals. The greatest growth acceleration occurred during the first 2 weeks at all levels and in both sexes. The growth increased as the protein level went up from 15 to 30 percent, with a decline with higher protein levels. ♂ ♂ exceeded ♀ ♀ in growth rate at all protein levels, although early growth was stimulated by larger amounts of protein up to 30 percent. Ultimate size was not affected by variations in the protein content of the feed. The rapid decrease in weekly percentage gain of birds receiving more than 25 percent indicates that such rations were not economical.

Processed garbage meal in the chick ration, C. I. DRAPER. (Hawaii Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 442-445).—In two experiments in which 14 lots of 20 Rhode Island Red chicks were fed to 6 weeks of age, the relative growth on rations containing processed garbage alone or with soybean meal, meat meal, or fish meal was compared. The inclusion of approximately 30 percent processed garbage gave satisfactory results when soybean meal or fish meal supplied the remainder of the protein. Garbage up to 20 percent gave satisfactory results with meat meal.

Sprouted soybeans, mash, and grains for emergency feeding of White Leghorn pullets, C. S. PLATT. (N. J. Expt. Stas.). (*Poultry Sci.*, 24 (1945), No. 6, pp. 505-508).—Continuing studies previously reported (E. S. R., 91, p. 583), three pens of White Leghorn pullets hatched March 5, 1943, were subjected to a change of ration for 6 days beginning January 8, 1944, from the regular feeding schedule of dry mash and grain ad libitum. In one pen the mash was removed and grain fed ad libitum; in another pen grain feeding was discontinued and the mash fed ad libitum; and in the third group the mash was discontinued and a mixture of sprouted soybeans and minerals fed as a substitute. Normal feeding was renewed in all pens after the 6 days. The sprouted soybeans were made by first soaking the beans for 24 hr. in warm water, then spreading on trays at room temperature for 4 days with 15 min. daily immersion in water. The sprouts of the soybeans were from $\frac{1}{2}$ to 1 in. in length when fed at the rate of 5 lb. (before sprouting) for each 100 birds daily. A mineral mixture of superphosphate, calcite flour, and salt was included. A fourth pen was continued without change on the regular feeding schedule with yellow corn,

wheat bran, wheat middlings, soybean meal, ground oats, meat scrap, limestone flour, bone meal, salt, poultry feeding oil, and alfalfa leaf meal. Artificial light was used in all pens from 4 a. m. eastern war time until daybreak.

The removal of the mash for 6 days did not affect egg production adversely in comparison with the check group, but there was a noticeable drop in egg production during the next 6 days. Egg production dropped from 57.14 percent to 19.64 percent in the 6 days when no grain was fed, and 6.55 percent during the following 6-day period when normal feeding was resumed. A heavy molt of body feathers occurred, after which a heavy feeding of soybeans and minerals seemed beneficial. In another trial sprouted soybeans and minerals satisfactorily replaced the mash for 6 days and in addition supplemented mash and grain feeding for the same period of time. Feeding sprouted soybeans and minerals in place of mash and grain for 6 days in March caused a drop in egg production from 64.8 to 51.88 to 51.19 percent and from 65.52 to 47.15 percent, with a control group at the same time showing a rise in production. The feeding of sprouted soybeans and minerals as a supplement to the mash and grain for 6 days in March and during April, May, and June had no significant effect on egg production but did save approximately 40 percent in mash consumption.

Poultry pasture, E. HOFFMANN (*Delaware Sta. Bul. 254 (1945), pp. 27, illus 4*).—In studies begun in 1940 of pasture for poultry, five $\frac{1}{8}$ -acre paddocks were plowed and treated with 1,000 lb. of lime and 500 lb. of 2-12-6 fertilizer. One paddock was used as a bare ground control and unseeded. Four were seeded with (1) grasses; (2) Ladino and white clover; (3) grasses and legumes; and (4) alfalfa and red clover. On May 22, 1941, 65 Barred Plymouth Rock pullets 8 weeks of age were placed on each range. A control lot of pullets was raised in a colony house with access to a wire sun porch. The weights and gains of birds were recorded at 8, 12, 16, 20, and 24 weeks of age to indicate growth.

The pullets on bare range consumed 4.79 percent more feed than the average of birds on all ranges, while confined birds ate only 1.09 percent more feed than the range average. The grass range group required 6.23 lb. per pound of gain as compared to 5.71 lb. for the grass and clover lot, 6.11 lb. for the bare ground lot, and 5.74 lb. for the confinement lot. Mortality was low in all lots for the 16 weeks. The ages required to reach 50 percent egg production in the different groups were, grass 201 days, Ladino clover 194, clover and grass 195, alfalfa and clover 194, bare ground 197, and confinement 188 days. There was no advantage in feed saving for any of the pastures when the birds were on unrestricted balanced rations as not enough herbage was consumed.

In the spring of 1942 the experiment was repeated along the same general lines, but the feed was restricted to 75 percent of that consumed by the groups in confinement and on bare range. On May 6, 1942, 65 Barred Plymouth Rock pullets 9 weeks of age were placed on each range and in the confinement pen. Because of losses from foxes, 24 pullets were added to each pen on June 3, in order to maintain the numbers. On the restricted rations sexual maturity was reached in 50 percent of the birds on Ladino clover 175 days, grass 192, grass and clover 200, alfalfa 185, and bare ground or confinement groups 181 days.

On June 7, 1943, 60 New Hampshire pullets were started on a 32-percent protein ration on each of the ranges and in the confinement pens. During the 3 yr. the botanical content of the paddocks had changed from the original seeding. The reduction of feed costs per pound of gain was about 15 percent as compared with the range-fed groups. Ladino clover made a most satisfactory poultry range. The 32-percent protein pellet ration plus grain fed free choice proved an economical and efficient method of poultry production.

Pasture experiments with growing pullets, G. F. HEUSER, L. C. NORRIS, and J. H. BRUCKNER ([*New York*] *Cornell Sta. Bul.* 823 (1945), pp. 22, illus. 1).—Ladino clover, grass pasture, and bare range with restricted and free-choice grain feeding were compared for the production of weight and gains in growing Single-Comb White Leghorn pullets in the 5 yr. 1940-44. The chicks varied at the start from 3 weeks to 3 mo. of age. The kind of range or moderate restriction of grain feeding gave satisfactory results provided the ration used was satisfactory. The different ranges showed no influences in the weights and gains of the pullets. Good grass pasture saved 7 to 22 percent of the food intake as compared with no pasture or bare range, but moderate feed restrictions with good pasture saved 3 to 8 percent on feed without influencing weight, maturity, or mortality. A more drastic feed restriction caused a reduction in average weight of 0.25 lb. at 6 mo. of age, later sexual maturity by several weeks, and lower egg production for 8 weeks. More feed was required. The feed restriction should be discontinued when pullets start laying, but neither rearing mortality nor sexual maturity was influenced unless there was a marked feed restriction. Pigmentation of birds on Ladino clover pasture was deep and uniform. Later egg production was not influenced except when there was marked feed restriction that modified growth and sexual maturity.

An indication of the extent of these studies may be gained from the fact that in 1940 there were three lots of about 325 Single-Comb White Leghorn pullets each on bare range pasture or Ladino clover, with full and limited feeding. In 1941, four lots of approximately 225 pullets each were full and limited fed on white clover and Kentucky bluegrass, Ladino clover, and bare range. Approximately 150 pullets were kept under the same management conditions during the first production year without significant differences in average age at which laying commenced or the age at mortality. In 1942 there were three lots of Single-Comb White Leghorn pullets on Ladino clover and one lot on average poor pasture. In 1943 there were four lots, three on Ladino clover and one on ordinary pasture, mostly Kentucky bluegrass, white clover, and weeds. The study in 1944 was conducted with three lots of Single-Comb White Leghorn pullets on Ladino clover and Kentucky bluegrass. The restriction of feed was usually accomplished by keeping the feeders closed for limited amounts of time.

Influences of spring bluegrass and mature bluegrass pastures on laying hens and on the eggs produced, G. D. BUCKNER, W. M. INSKO, JR., and A. H. HENRY. (Ky. Expt. Sta.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 446-450).—Supplementing the study previously reported (*E. S. R.*, 89, p. 351), bare or bluegrass range in connection with a complete all-mash ration did not influence consumption of mash by laying hens during the summer period after the grass had matured, but bluegrass range during the spring growing season lessened consumption of mash about 20 percent and bare range lessened it slightly. Neither influenced the health or weight of the hens or the eggs produced, the weight, or the hatchability of the eggs, but spring-grown grass increased egg production. Ground yellow corn and mixed wheat feed furnished the main part of the mash, which was kept before each of these lots of 23 White-Leghorn yearling hens at all times. One of these lots was confined to a house at all times, one had access for about 1 mo. to mature bluegrass pasture, and a third was on a range kept bare of grass. Determinations were made of the mash and bluegrass eaten, the composition of the droppings, the character, weight, and number of eggs, and the composition of egg yolks produced by each lot at periodical intervals. Access to spring-grown or mature pasture did not influence the average weight of the eggs or the weight of the dry yolk or dry shells. There was a decrease in the nitrogen-free extract of the droppings when the birds had access to spring bluegrass pasture. The droppings showed increased silica, calcium, and phosphorus when the hens had access to bare or bluegrass pasture. There was

no marked or orderly variation in the refractive index of the yolk fat or the gross energy value of the droppings.

Studies on organic factors required for prevention of anemia in chicks, M. L. SCOTT, L. C. NORRIS, G. F. HEUSER, and W. F. BRUCE. (Cornell Univ.). (*Jour. Biol. Chem.*, 158 (1945), No. 1, pp. 291-398).—The authors report feeding experiments showing that the *Lactobacillus casei* factor and the lactone either of 2-methyl-3-hydroxy-4-hydroxymethyl-5-carboxypyridine or the lactone (synthesized by the authors) of 2-methyl-3-hydroxy-4-carboxy-5-hydroxymethylpyridine are required for the complete prevention of the macrocytic, hypochromic anemia that develops in chicks fed a purified diet. The 5-carboxy lactone has been designated α -pyracin and the isomeric 4-carboxy lactone β -pyracin, both having shown a vitamin action. β -Pyracin was found to be considerably more active in promoting growth than α -pyracin, but was only slightly more effective in preventing anemia. Smaller quantities of β -pyracin and the *L. casei* factor were required to prevent anemia than were required to promote growth.

The results of hematological studies showed that when the *L. casei* factor alone was added to the diet, the kind of anemia which developed was a normocytic, hypochromic type. When β -pyracin was added alone, the kind of anemia that occurred was a macrocytic, normochromic type.

The relationship of clutch position and time interval between eggs to eggshell quality, L. R. BERG. (Wash. Expt. Sta. et al.). (*Poultry Sci.*, 24 (1945), No. 6, pp. 555-563, illus. 1).—Study was made of the relationship of position of the egg in the clutch to shell thickness and smoothness. Data are presented in tabular form for the eggs of five groups, three of which consisted of 36 White Leghorn pullets each, 36 White Leghorn hens in their second year of production, and 72 New Hampshire pullets, over a period of 30 days. The shell thickness varied with the position of the egg in the clutch. In two egg clutches the thickness of the shell of the second egg was greater than for the first egg. In three or more egg clutches the shells of the first and last eggs were thicker than those of the intermediate eggs. The last egg of longer clutches had a thicker shell than intervening eggs because of the increased time which the last egg spent in the uterus. The first egg of a clutch had a smoother shell than other eggs in the clutch. In two and three egg clutches the shell became rougher as position in the clutch advanced. In four to six egg clutches the shell became rougher with the first three or four eggs and then smoother with the last one or two eggs.

Preserving eggs in water glass, G. O. HALL. (Cornell Univ.). (*Poultry Sci.*, 24 (1945), No. 5, pp. 451-458, illus. 3).—Observations of 72 doz. eggs held for 6 mo. in water glass in an earthenware crock, pinewood pail, galvanized metal pail, or glass jar with a screw top showed that the interior egg quality did not vary when held under similar environmental conditions. Eggs stored in water glass solutions varied widely with temperature. For those at 34°-36° F. the quality of fresh eggs was approached except in odor and flavor, but as the environmental temperature was increased the quality deteriorated. Nearly all the eggs kept at room temperature were classified as inadequate due to the immobility of the yolks. With ordinary sanitary measures there was no advantage for the use of distilled water as contrasted with tap water or spring water for making the solution. The broken-out appearance of raw and hard-cooked eggs is illustrated.

Observations with Broad Breasted Bronze turkey breeding stock, J. E. PARKER and O. A. BARTON (*North Dakota Sta. Bimo. Bul.*, 8 (1945), No. 1, pp. 3-8, illus. 4).—Observations on 60 Broad Breasted Bronze turkey hens showed that an average of 60 eggs per hen were laid to June 1. Of the eggs laid 88 percent were fertile, and of these 78.4 percent hatched. The average hatchability of all eggs set during the season was 69.1 percent. Other data are recorded on artificial lighting, artificial insemination, and effect of cold weather on fertility.

The effect of relative humidity on hatchability of turkey eggs, W. O. WILSON. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 24 (1944), pp. 40-42).—The effects of 37, 46, and 57 percent relative humidity on the hatchability of turkey eggs were investigated. A variance analysis showed no significant differences between the three humidities as regards hatchability of turkey eggs set in two incubators.

DAIRY FARMING—DAIRYING

Measuring food values for dairy cows, M. KLEIBER, W. M. REGAN, and S. W. MEAD. (Coop. U. S. D. A.). (*Hilgardia [California Sta.]*, 16 (1945), No. 11, pp. 511-571+).—Carbon and nitrogen balances were measured on seven dairy cows in a double chamber respiration apparatus. These cows were used in pairs during the 2-yr. experiment. The cows were either dry fasting, dry on a maintenance ration of Sudan hay, or lactating. During lactation the cows were pair-fed. In addition to the maintenance ration of Sudan hay they received a supplement of glucose and casein. In subsequent periods barley replaced glucose and casein in one cow and then in the other, so that comparisons were possible between two pair-fed cows and also between two periods of each cow. The main period of each trial lasted 2 or 3 weeks. The respiration trials ran without interruption for 5 days each week.

It was found that a 1,000-lb. dry cow requires daily 7 lb. of Sudan hay to meet her protein requirement, but 14 lb. of the same hay to maintain energy equilibrium. Partial nutritive effects are defined as the difference in effects between two rations. Glucose contained per 100 gm. on the average 154 Calories partial net energy for lactation, casein contained 11 percent partial net nitrogen for lactation. In the ration for lactation 100 gm. of barley replaced on the average 9 gm. of casein plus 100 gm. of glucose. Such casein-glucose equivalents are proposed for measuring the nutritive content of feeds based on group trials with substitute reference substances. The variability of results in paired respiration trials as compared to ordinary group trials is discussed.

Outline of a new technique for digestion trial procedure, J. F. EHEART, C. W. HOLDAWAY, and A. D. PRATT. (Va. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 11, pp. 839-841).—Essential features of the described plan are: Proper collection and sampling by having a collector for each cow and a chemist present at all times during the trial; sampling of each voiding separately to insure a more representative sample; placing of a sample under sulfuric acid as quickly as possible to prevent bacterial action and loss of ammonia; running nitrogen on each 24-hr. sample, using 5-day composite dried samples for dry matter, approximate constituents, and mineral analyses, these to be ground with a Waring blender to insure a homogeneous mixture. A significant reduction in the variability in nitrogen content resulted from the use of this method as compared with the conventional method.

Digestibility of common lespedeza hay, L. L. RUSOFF, D. M. SEATH, and G. D. MILLER. (La. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 11, pp. 869-872).—A report is here given of this test, in which two lots of common lespedeza hay, representing the bloom stage and the early-seed stage, and containing, respectively, 10.52 and 8.55 percent crude protein on a dry-matter basis were subjected to digestion trials. Four dairy steers were used as test animals in each trial. Digestible protein values of 5.01 and 3.33 and total digestible nutrient values of 50.06 and 48.28 percent were found for the bloom stage and early-seed stage, respectively. As the lignin content of these hays increased the T. D. N. decreased.

Vitamin A and carotene content of the blood plasma of dairy calves from birth up to four months of age, L. A. MOORE and M. H. BERRY. (Md. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 11, pp. 821-826).—Tests were conducted on a group of dairy calves of the Holstein, Ayrshire, and Guernsey breeds reared under a plan

of limited whole milk, dry calf starter, grain, and hay feeding. The vitamin A content of the blood plasma of these calves between birth and 4 mo. of age ranged from 7.2 to 14 $\mu\text{g.}$ per 100 cc. Blood carotene values over the same period ranged from 16.5 to 100 $\mu\text{g.}$ per 100 cc., with a definite increase in value with advancing age. The feeding of a high-carotene lespedeza hay produced higher plasma vitamin A values in young calves than did No. 1 mixed clover and timothy hay.

Seasonal variations in the blood plasma carotene and vitamin A of adult dairy cattle, T. S. SUTTON and P. A. SOLDNER. (Ohio Expt. Sta. and State Univ.). (*Jour. Dairy Sci.*, 28 (1945), No. 11, pp. 859-867, illus. 6).—Data presented in this paper are based on monthly blood-plasma carotene and vitamin A determinations on 6 mature cows each of the Ayrshire, Guernsey, Jersey, and Holstein breeds over a 2-yr. period and also monthly samples from 16 dairy bulls over an 11-mo. period. The blood-plasma vitamin A values varied within rather narrow limits, ranging from 18 $\mu\text{g.}$ per 100 cc. in June to 24 in October. Average values of 17.7, 20.5, 22.0, and 23.1 $\mu\text{g.}$ per 100 cc. were obtained for the respective breeds. Much wider fluctuations occurred in blood-plasma carotene values, and the extent of change in these values with changing carotene intake varied greatly with the breed. Changes in blood-plasma vitamin A did not closely follow blood-plasma carotene changes, but tended to lag behind approximately 1 mo.

Utilization and excretion of ingested ascorbic acid by the dairy cow, M. G. VAVICH, R. A. DUTCHER, N. B. GUERRANT, and S. I. BECHDEL. (Pa. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 10, pp. 759-770, illus. 6).—In an attempt to contribute to the knowledge of the origin of vitamin C in the rumen, a Holstein cow was kept on a low ascorbic acid ration for 15 mo. while the ascorbic acid in the milk, blood, urine, and the rumen liquid drawn through a fistula were determined periodically. The ascorbic acid content of the blood plasma ranged from 0.28 to 0.59 $\mu\text{g.}$ per 100 cc. of blood. In the milk there was a gradual decrease in the ascorbic content as lactation advanced, but there was no relation to ascorbic acid intake. The urinary excretion was generally unpredictable. In the urine the daily excretion averaged 57 $\mu\text{g.}$, although the cow was on a low C intake. There was destruction in the rumen of crystalline ascorbic acid in both in vitro and in vivo studies. Concentration of ascorbic acid increased continually until about the third hour, when the rate of destruction appeared to exceed the rate of solution of ascorbic acid from the gases. Similar results were obtained in both in vivo and in vitro experiments. It is pointed out that "(1) ascorbic acid in crystalline form or as a part of a natural product (Cero-grass chops) is destroyed rapidly in the rumen; (2) the apparent independence of the cow for dietary ascorbic acid is reflected by normal concentrations of ascorbic acid in the blood and milk in spite of a low ascorbic acid intake over a prolonged period of time; and finally (3) the ingested intake of ascorbic acid on this low ascorbic acid ration is exceeded by the combined output of the vitamin in the milk and urine."

Milk lipase activity: A method for its determination, and its relationship to the estrus cycle, P. L. KELLY. (Ark. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 11, pp. 803-820, illus. 1).—The method in brief consists of obtaining dry, defatted milk solids from fresh milk by extraction first with acetone, then a mixture of acetone and ether, and finally with pure ether. Lipase activity was determined by incubating the solids thus obtained on a purified substrate. Tributyrin appeared to be a more sensitive indicator of milk which developed rancidity than did tricaproin, triacetin, tripalmitin, or sterilized butter oil. The testing of milk samples collected at frequent intervals from five unbred cows showed a relationship between the estrus cycle of the cow and the lipase activity of the milk which she produced. In all cases activity of the milk increased just before the heat period.

The effect of pitocin on milk lipase, P. L. KELLY. (Ark. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 11, pp. 793-797).—When pitocin was added to samples of normal milk and also to milks which spontaneously developed rancidity, the trybutyrinase in both consistently was activated. On substrates of pure butter oil or fractions of butter containing the longer chain triglycerides the effect of pitocin was unpredictable, sometimes increasing and sometimes decreasing the amount of hydrolysis. These findings indicate that forces can act on milk lipase which will cause it to attack individual substrates in the butterfat rather than all of those present to produce a characteristic taste and odor.

Growth of mammary glands of hypophysectomized rats following estrogen and lactogen administration, R. P. REECE and J. H. LEATHEM. (N. J. Expt. Stas.). (*Soc. Expt. Biol. and Med. Proc.*, 59 (1945), No. 2, pp. 122-124).—Varying doses of lactogen in different mixtures and estrogen were administered to groups of castrated hypophysectomized rats. Injections of lactogen caused a thickening of the duct system, and, in combination with estrogen, mammary duct growth similar to that from estrogen injections in intact rats was induced, showing the need for estrogen to bring about a maximum response.

A diacetinase in bovine mammary gland tissue, P. L. KELLY. (Ark. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 11, pp. 799-801, illus. 2).—An enzyme diacetinase which proved to be different from tributyrinase was identified in mammary gland tissue. Since diacetin is not known to be a constituent of blood, the importance of the presence of this enzyme in the mammary gland is problematical.

Some changes that may influence the dairy production business of the future, S. J. BROWNELL, C. Y. CANNON, W. E. KRAUSS, H. W. NORTON, JR., C. W. TURNER, E. WEAVER, and O. E. REED (*Jour. Dairy Sci.*, 28 (1945), No. 10, pp. 727-736).—It is surmised that the tremendous development in agriculture after the war will be associated with improvements in the selection and breeding of dairy cattle, including artificial insemination and the influence of the thyroid secretions on the production of milk and its constituents.

Milk production, H. O. WEST (*Mississippi Sta. Bul.* 401 (1944), pp. 104).—This is a compilation in which the results of experiments, mainly at this and other stations, on feeding for milk production and herd replacement are briefly summarized. Descriptions are included of the more common diseases and parasites of dairy cattle.

Economic aspects of "quality" in market milk, E. G. MISNER ([*New York*] *Cornell Sta.*, A. E. 531 (1945), pp. 29+).—The consensus of replies from 40 State experiment stations and colleges of agriculture was about equally divided as to whether composition or food value deserves consideration in evaluating the quality of market milk. Brief statements are presented from each source.

The keeping quality of pasteurized milk in the New York Metropolitan area during cool weather as determined by bacterial counts, presence of coliform bacteria, and flavor scores, A. C. DAHLBERG. (Cornell Univ.). (*Jour. Dairy Sci.*, 28 (1945), No. 10, pp. 779-792).—The initial standard plate count of pasteurized milk from six plants processing about 800,000 qt. of milk daily for the above area was about 12,000 colonies per cubic centimeter. There was 1 qt. or less of milk out of 18 samples on each of 3 consecutive weeks showing the presence of coliform bacteria and a total of 3 positive samples in 54 qt. as determined by 2 positive desoxycholate agar plates or by 2 positive brilliant green fermentation tubes out of 3, using 1 cc. of milk per plate. There were 2 positive brilliant green fermentation tubes of 108 desoxycholate plates poured, of which 9 were positive and 6 brilliant green. The milk averaged the score of 40 or "excellent" in flavor. For best results pasteurized milk should not be stored above 50° F. in the home, but if no pathogenic bacteria are present 60° might be allowed. The standard plate count of milk stored at 35°-40° and 45°-50° for 3 days was slightly reduced, but it began to increase thereafter.

After 4 days positive samples were 7 to 10 out of 18 total samples on each of 3 consecutive weeks. Several samples gave desoxycholate counts of 10,000 to 60,000 colonies. The flavor score held good for 7 days. In milk stored at 55°-60° there was a slight decrease in the standard plate count during the first day, and at the end of the second day it was increased to an average of 134,000 and thereafter exceeded 1,000,000. In 4 days at this temperature the milk was unsaleable, due to high acid or sour flavors. The majority of quart bottles of pasteurized milk became positive after four days' incubation at 50°-60° even though the tests of the fresh milk were negative. Milk collected in February kept as well as milk collected in October.

Bacteriological aspects of sterilized milk, D. A. MCKENZIE (*Dairy Indus.*, 10 (1945), No. 5, pp. 334-339, illus. 4).—The greatest source of trouble with the keeping of sterilized milk was contamination from improperly cleaned bottles and faulty cleaning of the dairy plants. While adequate supervision of the incoming raw milk should be maintained, the resazurin test will not necessarily reveal those supplies contaminated with large numbers of spore formers. Particular attention must be given to plant and bottle cleaning and sterilization to prevent these sources of contamination. Daily thoroughness in plant cleaning and sterilization is also important, particularly with bottle fillers. Thermometers and pressure gages should be checked regularly, with the exposure times carefully watched. Efficient processing will reduce losses in the sterilized-milk industry to a minimum. Bacteriological studies were made of 44 samples of milk sterilized under different conditions in nine plants. An extensive bibliography is included.

The gas requirements of molds.—IV, A preliminary interpretation of the growth rates of four common mold cultures on the basis of absorbed gases, N. S. GOLDING. (Wash. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 10, pp. 737-750, illus. 12).—Continuing these studies (E. S. R., 84, p. 240), four common mold cultures—*Aspergillus niger*, *Penicillium expansum*, *A. flavus*, and *Oospora lactis*—were grown at different pressures and temperatures of gas mixtures in dilutions of air with carbon dioxide, oxygen, and nitrogen, suggesting that the inhibiting effect of carbon dioxide on the growth of the mold is in proportion to its solubility and not in proportion to the composition of the gas above the medium or mycelium. In working this out either the pressure or temperature was altered. It appears that the oxygen requirement of these molds might be affected in a similar way, but this factor needs proof.

Variation in fat, ascorbic acid, and riboflavin content of goat's milk, A. D. HOLMES, H. G. LINDQUIST, and E. K. GREENWOOD. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 11, pp. 853-858).—Data are presented on the analysis of 39 samples of goat's milk, including 15 mixed-herd and 24 individual samples representing 4 different breeds of goats and ages from 1 to 12 yr. All samples averaged 4.3 percent fat and 16.8 mg. of ascorbic acid and 1.17 mg. of riboflavin per liter. In general, the riboflavin was lower and the fat and ascorbic acid content were not materially different from cow's milk. The significance of the difference of the values obtained for the milk of the four breeds is discussed.

The phosphatase test and its application to cheese, L. M. LAMPERT (*Jour. Dairy Sci.*, 28 (1945), No. 10, pp. 751-757).—The phosphatase test may be used on Cheddar, Monterey, Teleme, Feta, Romano, and cottage cheese and possibly other similar cheeses manufactured from pasteurized milk. None of these cheeses yielded as much as 35 µg. of phenol in the phosphatase test. When pasteurized milk containing 0.5 percent of raw milk was utilized in the manufacture, it was readily detected. Such cheese was differentiated from that made from milk heated to lower than pasteurization temperatures or for too short a time. Mold-free samples of cheese must be used.

The "smear" of brick cheese and its relation to flavor development, W. L. LANGHUS, W. V. PRICE, H. H. SOMMER, and W. C. FRAZIER. (Univ. Wis.) (*Jour. Dairy Sci.* 28 (1945), No. 11, pp. 827-838, illus. 5).—Determination of bacterial flora and pH on the surface of ripening brick cheese and the degree of nitrogen break-down on the surface and in inner sections of the cheese gave evidence that the slight odor of protein decomposition which distinguishes the flavor of normal brick cheese is produced by the organisms growing on the surface of the cheese and that this characteristic odor itself is absorbed by the cheese. There was no measurable analytical evidence of ripening "from the outside," although gradual diffusion of the characteristic surface flavor was observed. These experiments suggest that the flavor of brick cheese and related smear-ripened types may be controlled by regulating the development, activity, and preservation of the smear and its characteristic odors.

Influence of the frequency of transfer of lactic starters upon rate of acid development and quality of Cheddar cheese, A. C. DAHLBERG and F. FERRIS. (Cornell Univ.). (*Jour. Dairy Sci.*, 28 (1945), No. 10, pp. 771-778).—Study was made of the influence of frequency of transfer and incubation temperature of starters on the quality of Cheddar cheese. When lactic acid starters were inoculated every day or every third day and carried under excellent conditions, the quality, judged by appearance, flavor, and acid development, was identical. There were slight differences in starters incubated in milk at temperatures used in cheese making. Acid development was rapid and the same for cultures transferred daily and for an old culture carried at 86° F. Acid development was slow at 100°. At 86° for 2 hr. followed by 100° for 6 hr., development was good and the same for freshly transferred starters. Differences were observed in the cultures when freshly coagulated starters were used in cheese making, as contrasted with those secured in milk. Starters transferred every third day gave slower acid development in the curd. The acid development was almost arrested in the curd set at 100°. Cooling the cooked acid curd back to 86° did not affect the rate of increase in acid. The desired increase in acid at the higher temperatures by an initial incubation at 86° was very important in securing the desired increases. The increase in acidity was generally slowed by aging. When cheese starters were transferred every day they developed more quality or generally better quality than when starters were transferred every third day. Cheese ripening under more rapid conditions should have the flavor preserved by cold storage. Old starters produced unclean flavor in the cheese. When flavor developed rapidly, there was a tendency to overripen. The transfer of lactic cultures every third day reduced the acid produced during Cheddar cheese making processes, and incubation of the cheese milk at 86° increased the production of acid at the cooking temperatures. The quality of the whey and scores and flavors of the cheese were ascertained when fresh and after storage for 4 and 8 mo.

Ice cream with reduced sugar content, H. PYENSON and P. H. TRACY. (Univ. Ill.). (*Ice Cream Trade Jour.*, 41 (1945), No. 9, pp. 30, 32, 72-73, illus. 1).—To find the effect of reducing the sugar content of ice cream mixes on the freezing, texture, and flavor of ice cream, three mixes were prepared from 40 percent cream, 30 percent condensed skim milk, skim milk, and sucrose, and the freezing time, body, texture, and flavor scores of the ice cream were ascertained. The sucrose percentages were 10, 12, and 14. With the minimum amount of sucrose the freezing time was reduced, the drawing temperature was increased, the time to reach the desired overrun shortened, and the body, texture, and flavor scores were reduced. The ice cream containing 10 percent sucrose lacked sweetness, but that containing 12 percent was preferred in flavor by many to that with 14 percent sucrose. Egg solids may replace at least a part of the sugar solids. Cereal solids and other types of sterilizing materials added to low sugar mixes improved the body and texture.

To conserve on sugar, the sugar content should be lowered to not less than 10 percent in plain ice cream; the milk solids-not-fat should be raised toward 13 percent; cocoa could be added up to 3 percent. Fruit flavors also improved the score of low-sugar ice cream.

Post-war utilization of dairy products, G. C. NORTH, H. II. SOMMER, P. F. SHARP, and L. K. RIGGS (*Jour. Dairy Sci.*, 28 (1945), No. 10, pp. 721-726).—Some of the changes in the production and utilization of dairy products that have taken place during World War II are pointed out, and consideration is given to how these changes may affect the dairy manufacturing industry and the utilization of milk. Further interest is deemed likely to develop in various dairy products, including ice cream, cheese, butter, dried milk, evaporated milk, nonfat dry milk solids, and whey.

Keep your eye on new dairy products, W. B. COMBS and S. T. COULTER (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1945), No. 1, pp. 1, 12-13, illus. 5).—A brief description is given of new dairy products which are being developed in connection with greater use of surpluses. Reduced volume and weight were effected by dehydration in marketing of dry whole milk, dry milk combinations with other products, dry ice cream mix, dry whey, dry and concentrated cream and butter, butter oil, and various byproducts of cheeses such as skim milk and blue cheese.

VETERINARY MEDICINE

Postwar improvements in teaching veterinary medicine, N. M. NELSON (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 823, pp. 228-231).—This paper "is a plea for the recognition and application of visual methods in the teaching of veterinary science." Under the plan suggested, available veterinary film and slide materials would be duplicated and supplied by a central depository agency.

Fundamentals of surgical technic, J. FARQUHARSON. (Colo. State Col.). (*North Amer. Vet.*, 26 (1945), No. 10, pp. 591-597).—This is a discussion of the scientific aspects of good surgery and their application in practice. Special attention is given to anesthesia in small animals.

Manual of veterinary clinical pathology, D. L. COFFIN (*Ithaca, N. Y.: Comstock Pub. Co.*, 1945, rev., pp. 263+, about 70 illus.).—This is a revised and amplified edition (E. S. R., 91, p. 70).

Some effects of diet on the resistance of mice toward 2,4-dinitrotoluene, C. C. CLAYTON and C. A. BAUMANN. (Wis. Expt. Sta.). (*Arch. Biochem.*, 5 (1944), No. 1, pp. 115-120).—"Perhaps the most general conclusion to be drawn from these experiments is that the resistance of mice to dinitrotoluene can either be increased or decreased by alterations in the diet which themselves do not effect any very great change in the growth rates of animals not exposed to the compound. The results, therefore, support the view that good growth alone is not a complete measure of the biological value of a diet."

[Animal diseases in Colombia] (*Rev. Med. Vet. [Bogotá]*, 14 (1945), No. 88, pp. 1-55, illus. 9).—The following articles are included in this issue: Contribución al estudio de las enfermedades por hematozoarios en los animales domésticos [Diseases Caused by Hematozoans in the Domestic Animals], by G. Román (pp. 1-32); Primer caso de sporotricosis equina comprobada en el país [First Case of Equine Sporotricosis Authenticated in the Nation], by J. E. Albornoz (pp. 33-42); El diagnóstico serológico de unas cepas colombianas de Salmonella [Serological Diagnosis of a Colombian Strain of Salmonella], by E. S. Schultze F. and R. Caicedo A. (pp. 43-50); and Necrosis bacilar en los animales y difteria en los terneros [Bacillary Necrosis in Animals and Diphtheria in Calves], by R. Caicedo Aguilar (pp. 51-55).

[Stock poisoning in South Africa] (*Farming in So. Africa*, 20 (1945), No. 232, pp. 410-412, 419-422, 429-430, 436, 437-440, 445-447, 448, illus. 15).—Discussions are given on Krimpsiekte in Stock (usually caused by *Cotyledon* spp.) (pp. 410-412), Poisoning of Stock on Old and Harvested Lands (by various species of plants) (pp. 419-422, 436), Fungus-Infected and Fermented Stock Feed (pp. 429-430, 448), and Slangkop and Tulip Poisoning in Stock (pp. 437-440), all by D. G. Steyn; and on Jaagsiekte in Horses [due to *Crotalaria* spp.] and Sunn-Hemp Poisoning in Stock (pp. 445-447), by D. G. Steyn and S. J. van der Walt.

Local haemopoiesis as seen in the abomasum of the cow and sheep, F. DURAN-JORDA (*Vet. Jour.*, 101 (1945), No. 9, pp. 191-194, illus. 32).—This study of the stomachs of the pig, cow, sheep, horse, and smaller animals has in general confirmed earlier studies in man of the relation between the oxyntic cell and hemopoiesis and between the oxyntic cell and the eosinophil.

The relationship of bovine to human tuberculosis, J. W. RAINEY (*Vet. Jour.*, 101 (1945), No. 9, pp. 195-198).—Largely on the basis of experience in Queensland, the author defines his thesis "as, in effect, a plea for the abandonment of the test-and-slaughter policy for the control of tuberculosis or any other common disease of mammals on the grounds that it is in conflict with the nature of things and consequently must fail in the end. . . . Carried to its logical conclusion and applied to the control of all bacterial disease it would wipe out every species, including man himself."

A method of cultivating *Brucella abortus* for antigen without the use of agar, T. MOORE and C. A. MITCHELL (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 823, pp. 226-227).—A method is described in which the principle of cultivating organisms on boats of dialyzing paper floated on liquid media is adapted for the preparation of *B. abortus* antigen without the use of agar. Comparisons of a corn steep broth, a glucose broth, and each of these plus a 10-percent brewers' yeast hydrolyzate (B. Y. H.) revealed the greatest growth with the glucose broth plus B. Y. H. *B. abortus* grown on this medium was found to be suitable for the agglutination test and to be stable for at least 6 mo.

The diagnostic value of Rothera's test on milk, A. B. PATERSON (*Vet. Jour.*, 101 (1945), No. 9, pp. 199-204).—The author has applied Rothera's test "to milks containing added amounts of acetone, acetoacetic acid, and β -hydroxybutyric acid in varying proportions, and factors which might affect the reaction were considered. Milk samples were examined from normal cows, from cows displaying clinical ketosis, and from cows suspected of this condition but in reality suffering from other disorders." It is concluded that this test in milk samples is a valuable aid to diagnosis of bovine hypoglycemic ketosis, whereas the reaction of urine is of little value. The medicinal use of sulfonamides, strychnine, sodium salicylate, iodine, formalin, camphor, turpentine, and linseed oil was not found to interfere with the test in milk.

A case of mastitis due to *Clostridium perfringens*, J. O. FOSS and C. I. NELSON. (N. Dak. Expt. Sta.). (*North Amer. Vet.*, 26 (1945), No. 10, pp. 604-605, illus. 1).—A case of mastitis in a newly calved Guernsey heifer, in which the only organism obtained was *C. perfringens*, is described. Following large doses of sulfanilamide and the sloughing away of one quarter of the udder, complete recovery was eventually secured.

The role of an adequate water supply in the prevention of ruminal impaction in cattle, R. CLARK (*Jour. So. African Vet. Med. Assoc.*, 15 (1944), No. 3, pp. 113-119, illus. 1).—Attention is drawn to the studies of Schalk and Amadon (E. S. R., 59, p. 358) as indicating that the condition commonly noted among cattle in South Africa and often called dry gall-sickness is primarily an impaction of the rumen which occurs mainly on dry-grass grazing where water is scarce.

* *Jour. Physiol.*, 37 (1908), No. 5-6, pp. 491-494.

Toxicity of nematode-infested Chewings fescue seed, J. R. HAAG. (Oreg. State Col.). (*Science*, 102 (1945), No. 2651, pp. 406-407).—Following losses among sheep consuming a lot of Chewings fescue screenings essentially free from noxious weed seeds and ergot sclerotia, an ingredient highly toxic to rats was found, 40 parts of the powdered screenings mixed with 60 parts of a normal stock ration killing rats in about 10 days. Experiments with 2-week-old chicks indicated an even greater susceptibility.

The toxic factor was largely insoluble in ethyl and petroleum ethers, but was largely if not entirely contained in boiling alcohol extracts. A causal relationship was suspected between the toxicity and the degree of nematode (*Anguina agrostis*) infestation of the fescue seed.

Sheep diseases, H. S. CAMERON (Calif. Agr. Col. Ext. Cir. 130 (1945), pp. 36, illus. 12).—A discussion of disease in general is followed by a description of specific diseases as to economic importance, cause, symptoms, diagnosis, and control.

Use of sulfathalidine (phthalylsulfathiazole) in the treatment of enteritis in swine, E. V. EDMONDS (Jour. Amer. Vet. Med. Assoc., 107 (1945), No. 823, pp. 238-241).—This article is a clinical report on observations made of suckling pigs, feeder pigs, and mature hogs showing symptoms of enteritis and subsequently treated with sulfathalidine. The animals observed were selected from herds fed primarily on garbage and a few that received mill feed and milk. In each instance, the intestinal disturbance was manifested by diarrhea, fever, and inappetence.

Sulfathalidine was administered per os in tablet form with long-handled dosing forceps. For suckling pigs the doses were from 0.25 to 2 gm.; for feeder pigs 0.5 to 1.3 gm. per 10 lb. of body weight; and for mature hogs approximately 0.2 gm. per 10 lb. of body weight. Single daily doses for 4 to 6 days appeared to have been sufficient to overcome the infections. No toxic symptoms were noted, and it is concluded that sulfathalidine is of definite value in the oral treatment of the enteritis complex.

Immunization against swine fever (Agriculture, Jour. Min. Agr. [Gt. Brit.], 52 (1945), No. 8, pp. 374-376).—A large-scale trial at the Weybridge Veterinary Laboratory is reported which was designed to determine the antigenic value of the crystal violet vaccine against swine fever under normal farming conditions. Injection of this vaccine into susceptible pigs of any age over 3 weeks did not cause illness or abnormality and produced an immunity of high order effective for about 12 mo.

Pigs born from sows vaccinated before or during pregnancy may be satisfactorily immunized whether they are vaccinated while suckling or after weaning, although there was some evidence that with pigs vaccinated while suckling the degree of immunity tends to fall more quickly than with pigs vaccinated after weaning.

No antigenic differences were found in the various strains of swine fever virus. Vaccine prepared from the virulent American strain of virus protected pigs against naturally occurring swine fever caused by English strains of the virus. English strains of swine fever virus differed in their virulence, but on the whole were less virulent than the American strain used in the production of the vaccine.

Isolation of Erysipelothrix rhusiopathiae from farm-raised mink, G. R. HARTSOUGH (Jour. Amer. Vet. Med. Assoc., 107 (1945), No. 823, pp. 242-243).—*E. rhusiopathiae* was isolated from two farm-raised mink originating on widely separated ranches which were experiencing losses of an obscure nature. Other carcasses from the same outbreak were either negative bacteriologically or yielded streptococci. The pathogenicity of the organism for mink was regarded as questionable, especially after eight young mink remained healthy after injection with 24-hr. broth cultures of the organism. It is deemed more probable that its isolation in the two instances described was that of a secondary invader in mink whose resistance had been dimin-

ished by dietary deficiencies or by other diseases. Nevertheless, another means for the introduction and spread of swine erysipelas is indicated, as well as the possibility of human infection from handling infected mink pelts.

The development of highly malignant tumor strains from naturally occurring avian lymphomatosis, B. R. BURMESTER and C. O. PRICKETT. (U. S. D. A.). (*Cancer Res.*, 5 (1945), No. 11, pp. 652-660, illus. 6).—Since the development of a highly virulent strain of lymphomatosis would be very advantageous in the experimental study of the disease, experiments were carried on to develop such strains from cases of naturally occurring lymphomatosis in the control flock of the U. S. Regional Poultry Research Laboratory. It was found that young chicks injected intraperitoneally with affected organs of chickens with visceral lymphomatosis developed lymphomatous tumors of the viscera in a relatively short time.

Inocula prepared from different donors varied greatly in their activity. The material showing the greatest potency induced tumors in 13 of the 17 birds inoculated and caused death in an average of 11 days after inoculation. Tissues that became involved included the abdominal wall, adrenal, gonad, heart, kidney, liver, mesentery, intestine, pancreas, peritoneum, proventriculus, and spleen. The least potent material, though grossly similar to the most potent, produced no tumors in 37 chicks injected during the experimental period of 86 days. Four inocula that elicited a high proportion of tumors were propagated by serial transfer through 15 to 19 passages made at intervals of 7 to 14 days. No essential differences in the gross pathology between the strains were noted. The neoplastic cells implanted in young chicks induced lymphoid tumors that were both macroscopically and microscopically similar to the tumors providing the original inoculum.

A large roundworm, *Ascaridia lineata*, found in egg of fowl, G. O. HALL. (Cornell Univ.). (*Poultry Sci.*, 24 (1945), No. 6, pp. 496-498, illus. 1).—The inclusion of a large intestinal roundworm (*A. lineata*) embedded in the coagulated white of a chicken egg is illustrated. The means by which the roundworm got into the egg is discussed.

Aspergillosis in wood ducks, F. C. BELLROSE, JR., H. C. HANSON, and P. D. BEAMER. (Ill. Nat. Hist. Survey and Univ. Ill.). (*Jour. Wildlife Mgmt.*, 9 (1945), No. 4, pp. 325-326).—An outbreak attributed to feeding on spoiled corn from a crib partially destroyed by flood waters near Havana, Ill., is described. A fungus identified as *Aspergillus fumigatus* was recovered from the anterior organs of four of the birds.

Psittacosis in a parrot and in domestic pigeons, J. D. W. A. COLES (*Jour. So. African Vet. Med. Assoc.*, 15 (1944), No. 3, pp. 104-105).—A fatal infection in Johannesburg is reported as the first diagnosis of the disease in the parrot in southern Africa. The characteristic columbidian strain of the virus has also been isolated from fantail pigeons in Cape Province, its presence having been suspected only through the observance of viral granules in lung smears.

Effect of mercuric chloride on turkeys and on *Hexamita meleagridis*, E. McNEIL and W. R. HINSHAW. (Univ. Calif.). (*Poultry Sci.*, 24 (1945), No. 6, pp. 516-521).—Studies of the toxicity of mercuric chloride for turkey poults and of its therapeutic possibilities in outbreaks of hexamitiasis showed that concentrations greater than 1 : 8,000 may be toxic to normal poults and have a stunting effect. The 1 : 8,000 dilution was relatively nontoxic and was consumed by poults in about equal quantities with untreated water. However, even when used as the sole source of drinking water this dilution had no significant therapeutic value for poults infected with *H. meleagridis* when given in the carrier stage, just after infection, or as symptoms appeared. The treatment failed either to reduce the numbers of the parasite in the intestinal tract or to cause a migration from the upper to the lower intestine.

An outbreak of *Salmonella pullorum* infection in canaries, P. R. EDWARDS. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 823, p. 245).—An outbreak is described in which 50 birds in a flock of 75 died. Pure cultures of typical aerogenic strains of *S. pullorum* were recovered from all of the 13 birds autopsied.

AGRICULTURAL ENGINEERING

Methodology for soil tenacity and soil erosion studies, D. G. VILENSKY, trans. by D. B. KRIMGOLD (*Agr. Engin.*, 26 (1945), No. 11, pp. 465-467, illus. 6).—The processes of sheet erosion depend on the combined action of a large number of factors, among the most important of which are the properties of the soil being subjected to erosion, properties which determine the degree of resistance or the degree of susceptibility of soil to erosion. There are at the present time three main methods of study of these phenomena: (1) Direct study of sheet erosion under natural conditions on plots of various sizes and on soil monoliths, (2) the study of certain physical-chemical properties of soils with a view to determining the correlation between these properties and the resistance of soil to erosion, and (3) the direct study both under field and laboratory conditions of the tenacity of soils by means of methods specially developed for this purpose. It is on this third method of study the author reports. The tenacity of soils as a whole depends on one hand on the tenacity of the component parts of the soil, i. e., of its aggregates, and on the other hand on the cohesion between the aggregates, i. e., on the firmness of the structures of the soil. Work was directed toward the testing of existing methods of studying individual aggregates and of the soil structure as a whole and toward the development of new methods, using the following methodology: (1) Structural analyses of the soil conducted in the usual manner by means of segregating a given weight of air-dry soil on sieves; (2) determination of volume of aggregates and their specific gravity and porosity; (3) determination of the degree of slacking of aggregates involving two operations, the soaking of the aggregates and the analysis after slacking; (4) determination of the stability of aggregates when subjected to washing with drops of water; (5) determination of the rate of slacking of soil samples; and (6) determination of surface washing of soil samples. The author includes a complete description of the processes, methods, and apparatus used in each of the six listed determinations with a conclusion that experience with this methodology both under field and laboratory conditions indicates the possibility of obtaining the erosional characteristics of soil; these characteristics were shown to be quite close to those which were obtained by means of time-consuming determinations of the solid runoff from monoliths, and it is felt that direct investigation of soil tenacity may constitute an important means of speedily determining the general characteristics of soils for mapping purposes as well as of arriving at the nature of the properties which determine the resistance or susceptibility of soils to erosion.

Soil and water losses as affected by rainfall characteristics, J. H. NEAL. (Ala. Polytech. Inst.). (*Agr. Engin.*, 26 (1945), No. 11, pp. 463-464).—The factors which affect runoff can be grouped under two heads, precipitation and watershed characteristics, with precipitation by far the most important, especially heavy rains preceded by other heavy storms. In an attempt to correlate soil and water losses with rainfall conditions all rains occurring during the period 1939 to 1944 in the Auburn area were classified into four classes: Class 1, previous 10-day rainfall less than 1 in., and 30-min. intensity less than 0.5 in. per hour; class 2, previous 10-day rainfall less than 1 in. and 30-min. intensity 0.5 in. per hour or more; class 3, previous 10-day rainfall 1 in. or more, and 30-min. intensity less than 0.5 in. per hour; and class 4, previous 10-day rainfall 1 in. or more, and 30-min intensity 0.5 in. per hour or more.

Examination of the data thus obtained indicated that class 3 and 4 rains, which produced the greatest amount of runoff, occurred to a large extent during the month in which the heaviest rainfall occurred. Rains of less than 0.75 in., classed as 1, 2, and 3, produce little or no runoff, while those in class 4 produce runoff over 50 percent of the time. Class 1 rains between 0.75 and 1.5 in. produce little or no runoff, but classes 2, 3, and 4 rains produce runoff in most cases. Practically all rains above 1.5 in. produce runoff, and most of these rains were in classes 2, 3, and 4. Larger rains more likely come with high intensities and occur during a period where considerable precipitation has fallen in the previous 10 days. Soil moisture condition cannot be accurately determined by knowing the previous precipitation, since the season, vegetative cover, soil type, and wind conditions greatly affect soil moisture immediately after rains. Soil moisture is likely lower in summer than in winter for a given amount of rain in the previous 10 days, resulting in lower runoff when tabulated characteristics appear the same. Watershed characteristics lose their influence on runoff for rains falling on wet soil, yet they play a large role in affecting soil losses. Type of cover crop is an important factor in reducing erosion, and results show conclusively that when vegetative cover is light there is a heavy soil loss even for moderate amounts of runoff.

Summary of snow survey measurements in Oregon, 1926-1945 inclusive (*U. S. Dept. Agr., Soil Conserv. Serv., and Ore. Sta., 1945, pp. 90+*).—This summary, prepared by J. H. Carlton, is the fifth to be issued. Previous issues were made in 1932, 1935, and 1936 by the State Engineer of Oregon and in 1940 by the Division of Irrigation of the Soil Conservation Service cooperating with the Oregon Experiment Station, Medford Branch, and the Oregon State Engineer.

Jeep proves versatile in Morris farm tests, A. C. HEINE (*Minn. Farm and Home Sci. [Minnesota Sta.], 3 (1945), No. 1, p. 11*).—Tests of the "military type" and "agricultural type" jeep show that, on the road, a jeep will pull any load the average four-wheel farm trailer can carry. However, certain objectionable features from the standpoint of the farmer are: (1) Inability to turn as short as a tractor, 18-ft. turning radius required; (2) less than 9-in. road clearance prevents satisfactory row crop operation; (3) not as economical to operate as tractor, truck, or car; and (4) rear-mounted power take-off makes belting up difficult.

An improved sprayer boom for potatoes and other row crops, J. W. SLOSSER (*U. S. D. A. coop. Maine Expt. Sta.*). (*Agr. Engin., 26 (1945), No. 11, pp. 453-455, illus. 7*).—The many serious disadvantages of the conventional sprayer boom used for applying spray mixtures to row crops have been recognized for many years. The principal difficulty has been the factor of maintaining reasonable plant-to-nozzle relationships when operating over terraces and natural depressions. These uneven conditions exaggerate the boom movement necessitating constant attention in adjustments. In an attempt to overcome these shortcomings, the following requirements were set up: (1) The sprayer boom should be so constructed that ground surface irregularities do not affect its operation; (2) nozzle placement and distribution should be such that a maximum of the leaf surfaces of the plant will be exposed to the spray cones; (3) the amount of pressure and the nozzle type should be such that the individual spray particle travels with a minimum velocity, assuring that these particles do not bounce or run off the surface of the leaf or be deflected by a built-up air cushion; (4) the boom must be readily adjusted to compensate for plant growth during the season; and (5) the boom must have a minimum of mechanical complexity.

The new spray boom devised to meet these specifications consists structurally of an angle member to which are attached spray boomlets. These boomlets are fabricated of 1-in. pipe welded to strap hangers. Four conventional spray nozzles are used on each, two mounted on the upper pipe assembly in such a way as to spray the tops and sides of the row and two nozzles which operate near the ground, spraying

upward and outward and covering the stems and under leaf surfaces. A sliding shoe with vine agitator rods is welded to the lower end of the boomlet, which in operation rests on the soil surface between the plant rows. Since the boomlets are free to move in a vertical plane any irregularities in soil surface do not affect the position of the spray nozzle to plant relationships. Short lengths of hose are used to connect the supply boom with the nozzle assemblies, and the complete boom can be readily attached to any sprayer. A special adaptation for the application of aerosols by using a distribution system of copper tubing has also been devised to be used in conjunction with or apart from the standard spraying mixtures. Several advantages were obtained from the use of this boom, namely: (1) Greater total coverage of plant, (2) increased uniformity and distribution of spray material, (3) lower operating pressure (100 to 125 lb.) with consequent lowered costs due to longer life and more economical fittings, and (4) freedom from boom breakage (due to obstructions or dragging) and freedom from the necessity of boom-elevation adjustments.

Building and operating a farm grain drier, W. E. McCUNE, H. P. SMITH, P. T. MONTFORT, and E. S. HOLMES (*Texas Sta. Prog. Rpt. 968 (1945), pp. 8+*, *illus. 6*).—The authors give descriptions of all equipment used, a bill of materials, plans, and operating instructions for a farm-size grain dryer. Field tests proved that the moisture content of combined harvested grain sorghum can be reduced from 20 percent or more to 13 percent at an approximate cost of 30 ct. per ton when the cost of electricity is 2 ct. per kilowatt-hour and butane gas is 9 ct. per gallon. Indications are that this equipment could be used satisfactorily in the drying of oats, wheat, and barley and with minor changes clover, grass seeds, and perhaps peanuts. The unit in its present form does not appear suitable for the drying of rice. Complete installation cost of the unit of a size capable of handling grain sorghums at the rate of harvest of a two-row combine and including mechanical elevating equipment for loading and unloading the drier is estimated at between \$575 and \$700.

A portable tung nut decorticator, I. F. REED and R. E. JEZEK. (U. S. D. A.). (*Agr. Engin.*, 26 (1945), No. 10, pp. 413-414, 420, *illus. 2*).—The authors give a brief account of the development of the tung oil industry in the United States, together with a complete description of the construction details and operation characteristics of a newly developed tung nut portable huller. •

The packaging of American cotton and methods for improvement, J. W. WRIGHT, F. L. GERDES, and C. A. BENNETT (*U. S. Dept. Agr. Cir. 736 (1945), pp. 62+*, *illus. 27*).—Present-day methods of packaging and handling American cotton result in a substantial economic loss each year, with accompanying adverse criticisms in the markets of the world. Prompted by this condition the Department of Agriculture undertook a comprehensive study of the problem designed to explore various alternative possibilities of packaging which resulted in detailed information with respect to: (1) Mechanical feasibility of gin compression; (2) costs of gin compression as compared with costs of low-density packaging and recompression; (3) effect of gin compression on fiber quality and on acceptability of bales by cotton manufacturers; (4) adaptability of the package to transportation equipment and to the transportation freight-rate structure; and (5) suitability of the package from the standpoint of meeting trade, storage, and handling requirements. The standard-density gin press with three hydraulic rams and a 20- X 54-in. box designed to produce 500-lb. bales was found to provide the method of packaging that would most nearly fulfill the needs of the American cotton industry and be economically adapted to existing gin installations. The authors discuss in detail the packaging of cotton at gins in bales of "standard density" and the economic feasibility of this method with its effect on the marketing system and on the processing by mills. The mechanical features and operation of presses employing the standard-density method of packaging were presented in Circular 733 (E. S. R., 94, p. 118).

A method for designing insulation and ventilation for animal shelter buildings. J. L. STRAHAN (*Agr. Engin.*, 26 (1945), No. 10, pp. 407-412, illus. 5).—A presentation of a rational design for computing the amount of insulation required for any given set of housing conditions, correlated with the design of a ventilating system based on available fundamental biological data on heat and moisture production by livestock. Through examination of all known available sources of information on heat and moisture production by livestock obtained from calorimetric studies at Pennsylvania State College, University of Illinois, University of Missouri, and elsewhere, and by making certain assumptions, the author has developed and presented in the form of curves certain relationships between environmental temperature and percentage of total heat in latent form, percentage of heat in latent and sensible form in hundreds of British thermal units per hour, and amount of moisture per hour produced by large and small cows. Using these developed values, a typical mathematical solution of the design problem of insulation and ventilation requirements for a one-story stable to house 32 dairy cows under a temperature difference of 70° F. is given. These computations, based on available biological data and heat-balance formula, produce results that check fairly closely with established practice and indicate that a temperature difference of 70° is not impossible to obtain and can be held with sound economic construction. Computations using the rational method demonstrate also that 50° temperature difference can be maintained for poultry houses, and that the method can be applied to centralized hog houses to indicate the amount of additional heat that may be required for any given insulation specifications when pigs are farrowed in cold weather.

Functional requirements in designing laying houses for poultry. W. ASHEY, T. A. H. MILLER, G. L. EDICK and A. R. LEE (*U. S. Dept. Agr. Cir. 738* (1945), pp. 16, illus. 5).—The authors present aids to the design and construction of more satisfactory poultry structures based largely on a consensus of poultry and building specialists of the State agricultural colleges and the U. S. Department of Agriculture. The requirements given are stated in terms of space to be provided or function to be performed with no specific construction materials listed. A general discussion of the following factors is given: (1) Distribution of chickens by size of flock and by regions, (2) climatic conditions affecting laying-house requirements, (3) the hen and her habits, (4) environmental standards for laying hens, (5) types of laying houses, (6) building details, and (7) fixtures. A definite need is expressed for a much further study of poultry housing so that facts instead of opinions can be presented in the form of definite recommendations.

Farm building priorities for the postwar period. A. J. SCHWANTES and H. B. WHITE (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1945), No. 1, pp. 8-9, 14-15, illus. 3).—The authors discuss the long-time investment of extensive building additions and improvements for the successful farming enterprise and stress certain important principles or priorities to guide farmstead improvements in the immediate future when so many individuals desire to modernize at once and so much confusion exists in availability of materials and manpower. Five phases of the farmstead improvement problem to be given priority are: (1) A careful plan is needed for each farmstead; (2) building improvements should aim at saving time and energy, for three-fourths of a farmer's working hours are spent in and around farm buildings; (3) the farmhouse, as the homemaker's workshop and the family's home, should have a prominent place in plans for remodeling; (4) next to, and along with, electricity a water system presents the greatest opportunity for improvement; and (5) proper insulation should be considered in rebuilding as well as in new construction.

The farmhouse. V. H. FISCHER (*U. S. Dept. Agr., Libr. List 19* (1945), pp. 124).—A list of references to publications issued mainly during the period 1938 through 1944, covering information on planning, construction, remodeling, landscaping, new

technics, materials, equipment, and on policy and factual background for housing programs.

Recommendations of the joint committees on rural sanitation—rural water-supply sanitation. G. R. PHILLIPS ET AL. (*Pub. Health Rpts. [U. S.], Sup. 185 (1945), pp. 56, illus. 10*).—Various Federal agencies interested in the development of safe water supplies and in adequate measures for the disposal of sewage in rural and suburban areas have recognized for some years the importance of developing recommendations of a uniform nature that are based upon sound field experience in the construction, operation, and maintenance of sanitary facilities for such purposes. The studies made and presented in this committee's report are limited to the sanitation aspects of small water supplies used by one or possibly several families and by rural schools, recreational areas, camps, and similar developments which are without access to a public water-supply system.

The recommendations have been prepared primarily for the purpose of establishing a uniform approach for the sanitation of individual water supplies and are applicable to: (1) All newly developed supplies, (2) alterations or extensions to existing supplies to eliminate sanitary defects, and (3) maintenance of special vigilance on all questionable conditions found in existing systems until adequate sanitation corrections have been made. These recommendations are presented under the following main divisions: (1) Basic requirements for rural water supplies; (2) ground water, (a) elements of ground water geology and (b) sanitary recovery of ground water; (3) surface water; (4) water purification; and (5) pumping distribution, and storage; (appendix A) recommended procedure for cement grouting of wells for sanitary protection; and (appendix B) recommended procedure for disinfection of wells, springs, and appurtenances.

All persons engaged in developing water supplies should obtain the advice and cooperative assistance of the State sanitary engineering department concerned in order to determine compliance with existing regulations and requirements. In the absence of more rigid State or local governmental requirements, the recommendations of this report are offered as a guide.

AGRICULTURAL ECONOMICS

What peace can mean to American farmers: Expansion of foreign trade. B. W. ALLIN, F. F. ELLIOTT, O. C. STINE, ET AL. (*U. S. Dept. Agr., Misc. Pub. 582 (1945), pp. 21+, illus. 1*).—This third publication of a series (*E. S. R.*, 94, p. 120) describes past trends and tendencies in the foreign trade of the United States and the situation to be faced at the present time. A program for international collaboration is discussed under sections on cooperative stabilization of international exchange, cooperative expansion of international investment, cooperative food and agriculture programs, and cooperative development of commercial policy. Expansion but not uncontrolled trade and international collaboration and employment are discussed.

World food situation in 1945-46 (*U. S. Dept. Agr., Off. Foreign Agr. Relat., 1945, pp. 79+*).—The food situations in the major geographic regions of the world are discussed by countries. The world supplies of bread grains, feed grains, protein meals and feedstuffs, rice, sugar, fats and oils, meat, fish, milk, and dairy products, and eggs are also discussed.

Report of the Combined Food Board (*U. S. Dept. Agr., War Food Admin., 1945, pp. 10+*).—The organization of the Combined Food Board announced June 9, 1942, by President Roosevelt and Prime Minister Churchill, its collaboration with other agencies, and the actions taken by the Board from June 9, 1942, to December 31, 1944, regarding international allocations, production and distribution programs, shipping problems, coordinated-purchase agreements, directives to increase produc-

tion, measures for consumption control, civilian supply programs for liberated areas, and general studies are discussed.

Wartime shifts in feed and livestock production, W. S. EARP and E. McDONALD (*U. S. Dept. Agr., Misc. Pub. 569 (1945), pp. 52+*, illus. 7).—This publication is based on a report prepared during the summer of 1944 for administrative use of the Agricultural Adjustment Agency. Tables show by years and States and regions, 1940 or 1941 to 1943, 1944, or 1945, detailed data as to production and shifts in production of different kinds of livestock, poultry, and the principal feed grains. Other tables show for 1941-42 to 1943-44, the feed balances with indicated amounts for feed, industrial uses, food, seed, and exports; and the supplemental feeds—oilseed meals, animal proteins, mill products, and miscellaneous byproduct feeds; and the animal units, 1940-41 to 1943-44, of livestock and poultry by States and regions. Tables (1942-43 and 1943-44) and charts (1940-41 and 1943-44) make comparisons by regions of the production of feed grains by calendar years with grain consuming animal units in the following feeding years, 1942-43 and 1943-44. Pages 1-8 discuss the data presented in the tables and charts.

Soybean production in war and peace, E. G. STRAND (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, F. M. 50, pp. 41+*, illus. 5).—The development of the enterprise; the production regions; the yields, production, and utilization of soybeans; soybean processing; the sources, supply, and utilization of soybean oil, oil meal, and cake; prices; and the future prospects—markets, processing, and production—are discussed.

Wheat production in war and peace, C. P. HEISIG, E. R. AHRENDES, and D. E. MERRICK (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, F. M. 48, pp. 43+*, illus. 13; *rev. in North Dakota Sta. Bimo. Bul. 8 (1945), No. 1, pp. 21, 22*).—The acreage trends, 1910-44; yields—trends; factors causing lowered yields and improvement in yields, and the factors responsible; farm size and mechanization changes; and production and utilization of wheat are described. Postwar prospects for wheat and alternative wheat policies are discussed briefly.

Agricultural production, Texas, 1945, L. P. GABBAUD ET AL. (Coop. U. S. D. A.). (*Texas Sta., 1944, pp. 119+*, illus. 1).—This is an appraisal of agricultural production in Texas in 1945, prepared as a part of the national project of the U. S. D. A. Bureau of Agricultural Economics and the land-grant colleges, by representatives of the Texas Station, the U. S. D. A. Bureau of Agricultural Economics, Agricultural Adjustment Administration, and War Food Administration, the Bureau of Reclamation, U. S. Department of Interior, and other agencies.

Current Farm Economics [October 1945] (*Cur. Farm Econ. [Oklahoma Sta.], 18 (1945), No. 5, pp. 91-120*).—Included, in addition to the usual review of the agricultural situation and the tables of indexes of prices and purchasing power of Oklahoma products, are the following articles: Where Farmers Borrow—Distribution of the Oklahoma Farm Mortgage Debt by Type of Lender, 1930-1945, by R. T. Klemme (pp. 103-105), summarizing for Oklahoma the data in the report noted on page 390; Some Observations on Farm Ownership in Southeastern Oklahoma, by R. T. McMillan (pp. 106-110), a summary of the experience of a group of farm owners presented as an aid to prospective buyers; and The Relation of Staple-Length to Grades of Cotton in Western Oklahoma, by J. D. Campbell (pp. 111-117), based on data covering more than 25,000 bales of cotton ginned in October for 1941, 1942, 1943, and 1944 by 20 selected gins in 13 western counties. In the study it was found that in western Oklahoma $\frac{1}{16}$ - and $\frac{1}{8}$ -in. staples can be expected to make approximately one-half of a grade higher grade than $\frac{3}{32}$ -in. staples, and that a decline of about one-tenth of a grade can be expected for each $\frac{1}{32}$ -in. increase in the staple length for common staple lengths.

Relation of feed consumed to food products produced by fattening cattle, A. G. NELSON (*U. S. Dept. Agr., Tech. Bul. 900 (1945), pp. 36, illus. 9*).—Results

of the physical relationships involved in producing human food by fattening cattle in the Corn Belt are brought together. The cattle feeding enterprise, including number of animals grain fed annually, quantity of grain and protein supplements utilized, gain in live weight produced during the fattening period, etc., are described, and comparisons made of edible products and food nutrients produced per 1,000 feed units by fattened cattle, dairy cows, hogs, and chickens. Analyses are made of the relationships of feed consumed and slaughter grade, gain in live weight, body composition, gain in edible body, edible body composition, gain in edible body nutrients, and calories produced; and between gain in live weight and food products produced. The possibilities for greater food production in cattle feeding are discussed.

"Normally, about 4 million head of cattle are fattened in the Corn Belt each year and about 1.5 billion pounds of live weight is added to these cattle. About 11 billion pounds of grain (equivalent to about 200 million bushels of corn) and 275,000 tons of protein supplement are normally utilized annually in this fattening process. . . . Efficiency in feed utilization during the fattening period, measured by the aggregate quantity of edible protein, ash, and fat produced per unit of feed, increases slightly until approximately Good slaughter grade is reached. The maximum efficiency of feed utilization for animals that are heavy when the feeding begins, is reached at a lower slaughter grade than for calves. The point of maximum efficiency, as indicated by pounds of edible body nutrients, occurs in a 2-year-old steer just before it becomes of average Good slaughter grade, in a yearling when it goes just beyond the average of the Good slaughter grade, and for a calf when it is about Choice slaughter grade. . . . Cattle that are fattened in the Corn Belt to Choice or Prime slaughter grade gain an average of about 6 lb. of edible protein, ash, and fat (that is later consumed in the form of beef) per 100 lb. of grain fed during the part of the fattening period that comes before the animals reach the average of the Good slaughter grade. During the rest of the fattening period they gain an average of about 2 lb. of edible protein, ash, and fat (that is later consumed in the form of beef) per 100 lb. of grain consumed. . . . Normally, about 70 percent of the concentrates used in fattening cattle in the Corn Belt is required for the 80 percent of the gain produced before the animals reach the average of the Good slaughter grade, and about 30 percent is used for the 20 percent of gain produced after the average of the Good slaughter grade has been reached. If no cattle were fattened in the Corn Belt beyond the average of the Good slaughter grade (the point at which the carcass contains about the maximum quantity of fat that the average person will consume along with the lean meat), about 1.7 million additional head of cattle could be fattened annually with the concentrates normally used to fatten cattle in the Corn Belt. This would result in an estimated increase above normal production of about 15 percent in live weight and of about 25 percent in the aggregate quantity of protein, ash, and fat produced for human food—which would be consumed directly in the form of beef."

Man labor requirements for harvesting pole snap beans in Oregon, M. T. WILCOX and D. C. MUMFORD (*Oregon Sta. Cir. 166 (1945), pp. 47, about 14 illus.*).—The study was made to determine the relative efficiency of persons of different ages and sex in picking snap beans. Three studies were made, one based on interviews in the field in 1943 with 704 bean pickers, one on daily records of 1,236 youths in 14 platoons picking beans in the Salem area, and a third based on records of two growers in Lane County. Analyses are made in each study of such items as composition of the picking crews, amounts picked per picker, factors affecting amounts picked—age, sex, experience, yield per acre, length of day, etc.

The average picking crew in the Willamette Valley in 1943 appeared to be made up as follows: Children under 14 yrs. of age, 32 percent; high school children 14–17 yr. of age, 29; adults 18–55 yr. of age, 31; and persons 56 yr. and older, 8 percent.

The average number of pounds picked per day by the respective age groups were: 99, 152, 194, and 180 lb. As a general average pickers with one or more years' experience picked 158 lb. per day as compared with 140 lb. for those with no experience. It was indicated that children actually pick more beans per day if they work less than 8 hr. rather than more. No significant differences were found between the amounts picked by girls and boys or men and women. Yield per acre was not an important factor affecting quantity that could be picked per day. Careful supervision of pickers, especially younger children, increased the quantity picked per day. Cooperation of grower in training and encouraging pickers, providing good work conditions, etc., is conducive to high average accomplishments per picker.

Labor supply and farm production on eastern Kentucky farms, J. H. BONDURANT and W. D. NICHOLLS (*Kentucky Sta. Bul. 475 (1945), pp. 24, illus. 8*).—This study was made to determine whether and to what extent workers on farms in the area might be a significant source of seasonal or year-round labor for farmers or others outside the area. The data were obtained by interviews with 408 representative farm families in five counties in November and December 1942, and 413 families in June and July 1943. The families were classified according to productive work units accomplished and employability. The crop and livestock production for home use, the sale of farm products, the relation of production to labor available, the income of families classified according to availability for employment and of those with very little farm produce for sale, the effect of acreage of good arable land on income, and the possibilities of combining farms are discussed. The acreage, income, and labor required and available are discussed for four representative farms.

On the basis of work accomplished per family, 80 percent of the families accomplished less than 120 units, average 52; 12 percent, 120–180 units, average 142; and 8 percent more than 180 units, average 211. In the summer of 1943, about one-third of the heads of families were productively employed, another third was not available for employment away from the farm, and 35 percent were estimated to be potentially available for employment. The cash family income of those with regular jobs away from the farm was more than three times as great as those not having such employment. A large percentage of the farm families potentially available for employment away from the farm produced almost no farm products for sale.

"This study seems to indicate that the well-being of a considerable number of farm families in this large area of limited resources can continue to be improved by (1) heads of families obtaining regular employment and moving the family elsewhere, (2) adult workers obtaining temporary or part-time work away from the farm when not adequately employed on the home farm, (3) production of a larger family food supply through the adoption of proved good practices in the use of land, seeds, fertilizers, and so on, and (4) in some instances increasing the size of farm, where practicable, through leasing or purchasing suitable land vacated by persons leaving the area. This study also appears to warrant the conclusion that with the return to more normal conditions more of these 33 counties will be an important potential source of recruits for both farm and nonfarm work outside the area, especially for seasonal work in the months of July, August, and October, and to a lesser extent in September, November, and December."

Wages of agricultural labor in the United States, L. J. DUOFF (*U. S. Dept. Agr., Tech. Bul. 895 (1945), pp. 127+, illus. 25*).—"This report begins with a review of certain structural aspects of agriculture as an industry, in order to delineate the sector of the agricultural economy that is primarily concerned with the employment and wages of hired farm workers. Succeeding chapters give information on the Nation's hired farm workers, the agricultural wage structure, and wages as a factor in the cost of agricultural production. The movement of wages and earnings of farm laborers is examined in the light of associated conditions in agriculture and

industry, and an appraisal is given of long-time and recent trends in agricultural wage conditions. Special aspects of wartime wage problems in agriculture are then considered. The report concludes with an examination of some of the problems involved in formulating policies aimed at retaining or advancing during postwar years the recent gains achieved by farmers and wage workers."

Land prices, F. MILLER and H. C. FILLEY (*Nebraska Sta. Bul. 379 (1945), pp. 35, illus. 6*).—The bases of land value; the influence of World War I on land prices; changes in land prices, prices received for farm products, and prices paid by farmers for commodities purchased; activity in the land market; the forces that tend to increase the price of land and those that tend to prevent a land boom; and the curbs on land speculation are discussed and suggestions made to guide prospective land buyers. The discussions apply in general to the United States and in particular to Nebraska. Tables and charts included show among other things annual indexes, 1912-45, by States of the estimated price per acre of farm real estate; comparison of indexes of prices received for crops and livestock, prices paid by farmers for commodities, and prices of farm real estate in the United States, 1910-45, and of the prices received by farmers and prices of farm land in Nebraska, 1910-45; transfers of land by different methods as related to land prices in the United States, 1912-44, and Nebraska, 1926-44; and the total outstanding farm mortgage debt, January 1910 to 1944, in the United States and Nebraska.

The farm real estate situation in Maryland, L. B. BOHANAN, S. H. DEVAULT, and W. P. WALKER (*Maryland Sta. Bul. A35 (1945), pp. 61-74+, illus. 5*).—Tables and charts are included and discussed showing usually by years the relation of prices received by farmers and land value per acre, 1910-44; cash farm income and government payments in Maryland, 1924-43; estimated total value of farm land and buildings in Maryland (census years); indexes (1912-14 and 1935-39 = 100) of estimated value per acre of land and buildings; number of farms changing ownership by different methods, 1926-43; and the estimated farm-mortgage indebtedness, 1910-43. The opportunities in agriculture, how to compute the value of land, and the control of land values are briefly discussed and recommendations made regarding the control of inflation in land values and the acquiring of farms.

The total value of farms in the State increased from approximately \$242,000,000 in 1910 to \$274,000,000 in 1940, the peak being \$386,000,000 in 1920. The number of farms was 14 percent less and the number of acres in farms 19 percent less in 1940 than in 1910. The index of value per acre (1912-14 = 100) gradually increased from 97 in 1912 to 166 in 1920, then decreased to 90 in 1933 and 1934 and rose to 140 in November 1944. Voluntary transfers and trades per 1,000 farms in 1942 and 1943 were nearly double the number in 1940. The number of forced sales and related defaults was 4.5 per 1,000 farms in 1943 as compared with 14.2 in 1926 and 34.3, 32.5, and 28.4, respectively, for the years 1932-34, inclusive. Farm-mortgage indebtedness ranged from \$28,733,000 in 1910 to \$65,367,000 in 1921, then gradually dropped to \$39,349,000 in 1943.

Factors affecting price of farm land, Humphreys County, Tennessee, 1941-1944, B. H. LUEBEKE and A. H. CHAMBERS (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 189 (1945), pp. 30+, illus. 17*).—The real estate market situation in the county is described. Factors affecting the general level of farm values in the county; the differences in values, selling activity, and number of farms sold by soil class; accessibility as a factor in farm land prices; and the factors associated with farms in different price groups are discussed.

Distribution by lender groups of farm-mortgage and real estate holdings, January 1, 1930-45, H. C. LARSEN (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, pp. 69+, illus. 20*).—The amount of loans held by various lender groups and some of the major differences in loan standards and policies are reviewed briefly. The trend of

farm-mortgage debt and its distribution by lenders, the factors influencing the amount, trend, and geographical location of loans held by the major lender groups, the distribution of debt by tenure of mortgaged farms, and real estate holdings of selected lender groups are described and discussed.

Improving farm property assessments, W. P. WALKER (*Maryland Sta. Bul. A36 (1945)*, pp. 75-101+, illus. 4).—"The purpose of this bulletin is to give suggestions for improving the technic and results of assessing farm property." It describes and discusses the objectives in assessment, the legal requirements in the State, the practical aims, the preliminary work to assessment, the classification of lands, the determining of assessment values of lands, assessing buildings, the assessment of livestock, farm implements, and machinery, and the recording of the assessments of farm property.

Cost of producing milk in the Illinois portion of the St. Louis milkshed, R. H. WILCOX and C. S. RHODE (*Illinois Sta. Bul. 515 (1945)*, pp. 81-104, illus. 4).—The study is based on data for 93 farms in 1938 and 110 in 1939 in 11 counties in the Illinois portion of the St. Louis milkshed. In part 1, analysis is made of the quantities of different feeds used and hours of man labor absorbed in producing milk, and the percentages of the net cost of production that these items constituted. A method (formulas and charts) was devised for computing costs of production with different farm prices of corn, monthly wages of farm labor, and different yearly milk production per cow. Part 2 discusses the effect of production per cow, size of herd, use of milking machines, and season and month of year on milk costs.

Feed expenses constituted 44.5 percent and man labor 25.5 percent of the net cost of producing milk. Of the other costs, 22 percent fluctuated with feed costs and 51 percent with farm wages. Cost of milk production per 100 lb. was \$1.55 for cows with an annual production of 8,500 to 9,500 lb. and \$1.98 for those producing less than 5,500 lb. In herds of 10 to 30 cows, the addition of a single cow saved enough man labor and other costs to lower the cost of production 1 ct. per 100 lb. of milk. Milking machines enabled users to produce 7 lb. more milk per hour of labor and resulted in an annual saving of \$4.70 per cow. In the 198 herds for which monthly records were available the average monthly profit was \$1.61 per cow during the five summer months, and 63 ct. during the seven winter months. The average yearly profit was \$11.19 per cow. Herds in which March, April, and May production rose as high as 140 percent of the annual monthly average and that in September, October, and November dropped below 75 percent of the average returned a profit per cow of \$10.40, while herds for which the production in any month was not more than 20 percent below or above the monthly average for the year returned a profit of \$14.28 per cow.

Fluid milk and fluid cream sales, Allegheny County, 1936-44, C. W. PIERCE (*Pennsylvania Sta. Bul. 470 (1945)*, pp. 21+, illus. 4).—This report is based chiefly on data as to sales of fluid milk and cream from the following sources: A report of sales in November 1936 (E. S. R., 82, p. 407); monthly estimates of sales, May 1937 to August 1938, by the Bureau of Business Research, University of Pittsburgh, and September 1938 to July 1944 by the department of agricultural economics of the Pennsylvania State College; a survey made in April 1944; and indexes of pay rolls of firms in western Pennsylvania, May 1939 to May 1944, published by the University of Pittsburgh. The changes in sales of milk and cream, the causes of variations in milk sales, the relation of sales to consumer incomes, and postwar possibilities for the milk industry in the county are discussed.

Average daily per capita sales of fluid milk increased from 0.432 pt. for November 1936 to 0.6 pt. for April 1944, an increase of approximately 40 percent. Per capita sales of cream decreased from 0.11 pt. milk equivalent to 0.082 pt. The index of payrolls increased 165 points from May 1939 to May 1944, and each 10-point increase was accompanied by approximately \$2,000 in the value of milk sold.

Price spreads between farmers and consumers for food products, 1913-44, R. O. BEEN ET AL. (*U. S. Dept. Agr., Misc. Pub. 576 (1945), pp. 290+*, illus. 20).—The material presented “represents comprehensive revision and expansion of series which have been published in the past, dealing with marketing charges and price spreads between farmers and consumers of food products, and includes a number of new series and comparisons.” The series show “retail cost per unit of farm food products, farm value of equivalent produce, the price spread or marketing margin, an estimate of marketing charges, and the farmer's share of the retail cost.” The distinctive features of the report are outlined. The material is analyzed and discussed in sections dealing with the charges for marketing farm food products (pp. 5-24); the basic data—prices paid by consumers and prices received by farmers (pp. 24-29); farm-produce equivalents, byproduct allowances, and time lags (pp. 29-32); Federal taxes and payments in food marketing (pp. 32-42); the National marketing bill for farm food products, 1913-43 (pp. 42-47); and the market basket of family purchases of farm food products (pp. 47-59). The greater part of the report is devoted to analyses, series, discussion, etc. by commodities groups, and subgroups as follows: Meat products—beef, pork, and lamb (pp. 60-90); dairy products—fluid milk, butter, American cheese, and evaporated milk (pp. 90-116); poultry and eggs—chicken and eggs (pp. 116-130); bakery and other cereal products—white pan bread, whole-wheat bread, rye bread, soda crackers, white flour, corn meal, macaroni, corn flakes, rolled oats, wheat cereal, hominy grits, and rice (pp. 131-201); fruits and vegetables—fresh vegetables, fresh fruits, shrinkage allowance, canned fruits and vegetables, other fruits and vegetables, and retail price adjustments (pp. 201-252); and miscellaneous products—margarine and vegetable shortening, salad and cooking oil, peanut butter, corn sirup, and sugar (pp. 253-286).

Wartime transportation of farm products and farm supplies by motor vehicles in Maryland, W. P. WALKER, S. H. DEVAULT, P. R. POFFENBERGER, and A. M. ABEALT (*Maryland Sta. Bul. A34 (1944), pp. 27-60+*, illus. 8).—Data were obtained by interviews from 198 feed and 125 fertilizer dealers and 407 farmers. Estimates based on acreages, numbers of animal units, etc. are made of the tonnage of farm products hauled on farms and of supplies hauled to farms. Detailed records of the survey conducted in 1936-37 by the Maryland Highway Planning Survey are also utilized. Analyses are made of the number of motor vehicles and tractors on farms, volume of products hauled on and from farms, types and age of motor vehicles used, volume of products hauled and distances hauled in transporting products from farms to local markets, the volume of farm supplies transported to and on farms, the kinds of feed handled by local dealers, the practices in delivering feed and fertilizer, and the truck equipment used.

In 1943, 3,141,000 tons of farm products, including containers, were hauled on farms and 1,661,000 tons to markets. Field crops constituted 53 percent of the on-farm tonnage, and vegetables and canning crops 34 percent and dairy products 37 percent of the to-market tonnage. Of 3,140 vehicle loads arriving at market concentration points, 40 percent were transported by farmers' standard stake trucks, 25 percent by farmers' pick-up trucks, and 20 percent by farmers' automobiles. The average ages of motor vehicles were: Automobiles, 9.2 yr.; regular trucks, 8.4; pick-up trucks, 6.9; and commercial trucks, 5.6 yr. The average number of pounds carried per load were: Automobiles, 369; pick-up trucks, 748; regular trucks, 3,196; and commercial trucks, 4,445. The average round-trip mileage ranged from 8 miles for automobiles to 48 miles for commercial trucks. Farmers' regular trucks carried 172 lb. of farm products per mile of travel; automobiles, 47 lb.; and commercial trucks, 92 lb. In 1936-37, about 33 percent of the trucks hauling farm products on the highway hauled fresh fruits and vegetables and 31 percent livestock, poultry,

and milk. Nearly half as much farm produce was hauled from Baltimore to smaller cities as was destined for Baltimore. About 858,000 tons of farm supplies were transported to farms in 1943, of which 45 percent was feed.

Inventory of farmers' cooperatives, Pennsylvania, 1943, J. K. STERN (*Pennsylvania Sta. Bul.* 474 (1945), pp. 63+, illus. 47).—A printed revision of Journal Series Paper 1254 (E. S. R., 92, p. 573), with additional illustrations, a few revisions in the text, and the addition of sections on the Pennsylvania cooperative acts and how to incorporate a farmers' cooperative.

RURAL SOCIOLOGY

Agricultural history of Knox County, Tennessee.—II, From 1860 to 1900; III, From 1900 to 1940, H. J. BONSER and C. C. MANTLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monogs.* 187 (1945), pp. 43+, illus. 7; 188 (1945), pp. 37+, illus. 9).—These continue this study of Knox County agriculture (E. S. R., 94, p. 125).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

OES tenth reader, S. L. SMITH and G. ADAMS. (U. S. D. A.). (*Jour. Home Econ.*, 37 (1945), No. 3, pp. 150–152).—This classified list of State agricultural experiment station research publications appearing in 1943–44 deals with food preparation and selection, food preservation, nutritive value of foods, food habits and nutrition problems, family economics and family life, textiles, and equipment.

FOODS—HUMAN NUTRITION

Elements of foods and nutrition, M. T. DOWD and A. DENT (*New York: John Wiley & Sons; London: Chapman & Hall*, 1945, 2 ed., pp. 357+, illus. 37).—This textbook is a revision of an edition appearing in 1937 (E. S. R., 78, p. 131). The scope of subject matter has been enlarged to incorporate new developments and provide a more thorough coverage of certain nutrition phases.

Some factors affecting the nutritive value of plants, O. SHEETS (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 9, pp. 1, 7, 8).—This is a brief popular summary of results reported in earlier technical publications (E. S. R., 91, p. 93; 92, p. 309; 93, p. 643) concerned with the influence of such factors as variety, maturity, soil, fertilizer, and environment on the composition of turnip greens.

A survey of fruit production and consumption in South Dakota, 1944 (*South Dakota Sta., Agr. Econ. Pam.* 17 (1945), pp. 15+, illus. 4).—Because of the increasing stress placed on fruit in the diet in recent years, a survey of 1,200 rural and urban families was made to determine its production and consumption in South Dakota during 1944. Analysis of the survey data indicates that, for the State as a whole, urban families averaged slightly above and rural families slightly below the minimum daily intake of fruit suggested by nutritionists. Numerous tables are given showing percentage of families producing fruit and tomatoes; the per capita consumption of fruit; and the kinds, quantities, and availability of fruit that may be purchased.

Consumer demand for meat: Syracuse, New York, 1942, R. H. ANDERSON ([*New York*] *Cornell Sta. Bul.* 816 (1945), pp. 40, illus. 13).—This study, based on a survey conducted in March and in June 1942, was directed toward measuring the variability in quantity, prices, and expenditures for various kinds and cuts of meat of Syracuse, N. Y., families for 1 week. Causes for these variations, such as economic status, size and composition of the family, nationality, religion, and seasons of the year are discussed and presented in tabular form.

Research lends a hand in meat cookery, I. NOBLE (*Minn. Farm and Home Sci. [Minnesota Sta.]*, 3 (1945), No. 1, pp. 2-3, illus. 3).—The relation of cooking methods to nutritive value and palatability of meat is considered briefly in the light of results obtained in a study conducted as part of the National Cooperative Project, Conservation of Nutritive Values of Foods. The meat cooking methods recommended for the study involved the principle that tender cuts should be cooked with dry heat and less tender ones with moist heat, the cooking to be done at a low temperature (300°–350° F.). Beef roasts cooked by the recommended method retained about 55 percent of the amount of thiamine they contained when raw, while lamb roasts retained about 70 percent and pork about 63 percent. Small amounts of thiamine were in the drippings.

Cooking with dried eggs (*U. S. Dept. Agr.*, 1945, AIS-28, pp. 16, several illus.).—This publication, written in popular style, considers the advantages in using dried eggs, their nutritive value, the way to keep them, and the way to reconstitute and use them. Numerous recipes are given.

Determine quality from pea solid readings, W. E. PYKE (Colo. Expt. Sta.). (*Food Packer*, 26 (1945), No. 8, pp. 44, 46, illus. 3).—Analytical measurements reflecting the quality in canning type peas were compared with tenderometer measurements on paired samples. Close correlations between solids and starch and tenderometer readings were found; the coefficient of correlation between pea solids and tenderometer readings was 0.96, and the correlation between tenderometer and starch was 0.93. A chart is given from which the percentage of solids can be read for any reasonable tenderometer reading. "The correlation for sugars with tenderometer reading was not good. This is not surprising because varietal differences here are known to be rather great."

Studies were also made to determine the coefficient of correlation with the tenderometer for carotene (found to be 0.32) and ascorbic acid, in which it is noted that the tenderometer regression in sized peas is definitely curvilinear. The sugar beet green, it is pointed out, is superior to spinach as a green for the packing industry, as well as in vitamins, flavor, and cooking qualities.

Observations on the oxidase of garlic, J. SUGIHARA and W. V. CRUESS (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 10, pp. 297-298).—With a view toward characterizing the enzyme system responsible for the darkening of garlic extracts, freshly ground garlic tissue was subjected to tests for oxidase and dehydrogenase. The color changes in the presence of benzidine, guaiacol, gum guaiac, or α -naphthol indicated the presence of a complete oxidase, while the bleaching of methylene blue in an evacuated tube indicated the presence of dehydrogenase. Finely ground garlic cloves (freed of outer paper husks) subjected to preliminary extraction with acetone yielded a phosphate buffer (pH 6.7) extract from which an enzyme preparation could be obtained by precipitation with alcohol added to a final concentration of about 75 percent. A water solution of the enzyme precipitate in the presence of H_2O_2 gave characteristic color reactions with various substrates (α -naphthol, resorcinol, pyrogallol, gum guaiac, and 17 others), thus indicating the peroxidase nature of the enzyme precipitate. The negative reaction with tyrosine indicated that tyrosinase was probably absent. Other measurements showed that the optimum pH value was in the range 5.05 to 5.15, using guaiacol as substrate, and that the enzyme was inactivated by heating to 90° C. in 5 min. but survived 85° for 5 min. at neutrality (pH 7.0). Incubation of the enzyme extract with trypsin for 20 hr. destroyed all peroxidase activity, suggesting the presence of a protein component. When buffered to approximately pH 5.0, the extract failed to oxidize added ascorbic acid; but on adding a trace of catechol with the ascorbic acid, oxidation of the acid was fairly rapid. Cyanide completely inhibited and halogen ions markedly reduced the activity of the enzyme preparation.

Notes on apple products in the Yakima area, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 10, pp. 292-295, illus. 3).—This article presents notes made on a tour of apple products establishments in the Yakima district of Washington State. In this region, apples are grown principally for the fresh market, but manufacturers found that culled fruit could be used successfully in drying, canning, freezing, and in byproducts such as brandy, vinegar, pectin, and apple juice. A brief resumé of the operations in preparation, drying, and packing of dried apples is given.

A study of methods of clarification and blends of Massachusetts apples for apple juice, W. B. ESSELEN, JR. (Mass. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 6, pp. 165-168, 189).—Of the three methods of clarification used, the flash-heating method was found particularly effective in producing apple juice of good quality with respect to color, flavor, and degree of clarity. Apple juice clarified by this method showed no tendency to throw down a sediment during storage and was superior in flavor to juices clarified by the use of bentonite (0.075 oz. per gallon for 30 min.) or the use of pectinol (at the rate of 0.18 oz. per gallon for 15 hr. at room temperature). In Massachusetts and New England, the McIntosh variety is the most important commercial apple crop, but cider or juice made from it is generally considered to be flat and insipid in flavor. Tests were made to determine the optimum amount of McIntosh apples that could be blended with Baldwin or Delicious varieties to yield a good commercial product. It was found that blends of Baldwins containing up to 60 percent of McIntosh made a pleasing product. Blends should not contain more than 25 percent of Red Delicious apples due to their strong aromatic flavor.

Sugar substitutes and their uses in canning and baking, J. E. RICHARDSON and H. L. MAYFIELD (*Montana Sta. Cir.* 183 (1945), pp. [7]).—This revision of Circular 168 (E. S. R., 88, p. 545) gives tables showing proportions of sugar and sugar substitutes for four types of canning syrup (based on 4 qt. of canned fruit); a revised canning timetable for hot water-bath processing at various altitudes in Montana (E. S. R., 89, p. 602); and suggestions as to possible solutions in various canning problems. Using sugar substitutes, recipes are given for preserves, jams, jellies, gingerbread, and cakes.

Foods and drugs, E. R. TOBEY (*Maine Sta. Off. Insp.* 195 (1945), pp. 119-202).—This report (E. S. R., 92, p. 296) is devoted to the presentation of analytical data obtained in the course of routine inspection analyses of samples of bologna, frankfurts, sausage, milk and cream, a dietetic beverage, hamburger steak, maple syrup, imitation olive oil, oil used in packing sardines, pickling compounds, vinegar, sardines, shellfish, hydrochloric acid, spirit of camphor, and spirit of peppermint. Findings in the bacteriological examination of various foods are also summarized.

How to preserve food, W. W. CHENOWETH (*Boston: Houghton Mifflin Co.*, 1945, pp. 289+, illus. 84).—In this book, the author has simplified the scientific and practical knowledge essential to food preservation in the home. It outlines methods of preservation suitable for various foods; makes suggestions (with illustrations) for purchasing and improvising equipment for use in preparation, preservation, and storage; and includes some recipes. A few tables of weights and measures and processing times and temperatures are also included.

The nutritive value of canned foods, I-V (*Jour. Nutr.*, 28 (1944), No. 2, pp. 101-140).—Five papers are presented:

I. *Introduction and sampling procedure*, L. E. Clifcorn (pp. 101-105).—The program conceived in 1942 was planned to obtain complete information on the nutritive value of commercially canned foods; the effects of preparation methods used in the home, restaurant, and Army kitchens; and the effects of time and temperature of storage on certain vitamins in canned foods. Thirty-two products,

including various canned fruits, vegetables, and fish (823 samples) were selected to be assayed for ascorbic acid, carotene, riboflavin, niacin, thiamine, and pantothenic acid, the work to be carried out at various universities. Samples in commercial size (No. 10) and retail size (No. 2 or 2½) cans were taken from the main canning areas for each product. When possible, "run of the mill" samples were obtained, and sampling was made at various times during the day and during the early, middle, or late part of the canning season. A complete history of each sample was also obtained. Net weight, drained weight, pH, and general quality were determined at a central distribution point prior to sending six retail size or one No. 10 can to each collaborating laboratory.

II. *Ascorbic acid and carotene or vitamin A content*, A. Pressley, C. Ridder, M. C. Smith, and E. Caldwell (pp. 107-116) (Ariz. Expt. Sta.).—Ascorbic acid was determined by the method of Morell (E. S. R., 87, p. 15), carotene by that of Moore and Ely (E. S. R., 86, p. 586), and vitamin A by a modification of the classical method of Carr and Price (E. S. R., 56, p. 10), using the Evelyn photoelectric colorimeter. The percentage of solids and liquids was determined by draining the opened cans and weighing separately. Composited semihomogeneous samples of the combined solid and liquid portions of all the cans were prepared in a Waring Blendor. Of the 33 canned foods analyzed, the best sources of ascorbic acid (average, over 10 mg. per 100 gm., or 100 cc.) were the following: Orange juice 39.4, grapefruit juice 33.8, grapefruit segments 24.6, tomatoes 16.5, green asparagus 15.2, bleached asparagus 14.9, tomato juice 12.9, and spinach 11.4. Best sources of carotene were: Carrots 10.54, spinach 4.58, and apricots 2.13 mg. per 100 gm.

III. *Thiamine and niacin*, M. Ives, J. R. Wagner, C. A. Elvehjem, and F. M. Strong (pp. 117-121) (Wis. Expt. Sta.).—The thiochrome method, with modifications (described), was used for the thiamine determinations. The procedure of Krehl et al. (E. S. R., 90, p. 727) was used for niacin assays. The data are reported in milligrams percent. Average thiamine values of over 0.05 mg. percent were found in the following canned foods: Peas 0.115 and 0.099, orange juice 0.072, sliced pineapple 0.070, green asparagus 0.067, baked beans with tomato sauce 0.053, and pineapple juice 0.052. Best sources of niacin were the fish products: Tuna 10.2, mackerel 7.82, salmon 7.81, sardines in oil 5.57, sardines in tomato sauce 3.93, dry-pack shrimp 2.23, and wet-pack shrimp 1.36. The best vegetable source of niacin was peas, the sweet, wrinkled variety averaging 1.06; while the high value in fruits was in peaches, 0.70. Variations ranging as high as sixfold was found in different samples of the same food. No correlation was found between the thiamine or niacin content and the can size, time of harvest, or pH of the product, with the exception of peas, the thiamine content of which appeared to be highest toward the latter part of the season.

IV. *Riboflavin and pantothenic acid*, M. L. Thompson, E. Cunningham, and E. E. Snell (pp. 123-129).—A detailed description of the enzymatic preparation of the samples is given. Riboflavin was determined by the method of Snell and Strong (E. S. R., 82, p. 587) and pantothenic acid by that of Pennington et al. (E. S. R., 85, p. 442) and Neal and Strong (E. S. R., 90, p. 728). Highest average values for pantothenic acid (expressed as calcium pantothenate) in milligrams percent were as follows: Salmon, 0.57, sardines in oil 0.53, sardines in tomato sauce 0.47, mackerel and dry-pack shrimps 0.29, tomato juice 0.25, yellow whole kernel corn 0.21, green asparagus 0.19, and white corn 0.18. Average riboflavin values above 0.1 mg. per 100 gm. occurred only in the canned fish: Mackerel 0.20, sardines in tomato sauce 0.18, salmon 0.16, tuna 0.14, and sardines in oil 0.11. The highest vegetable sources of riboflavin were green asparagus 0.096, spinach 0.082, bleached asparagus 0.058, and peas 0.054-0.049. Different samples of a given canned food varied considerably in their content of riboflavin and pantothenic acid, as was

observed in the above study in the case of ascorbic acid, and these variations could not be correlated with can size or with time of harvest.

V. *Distribution of water soluble vitamins between solid and liquid portions of canned vegetables and fruits*, M. K. Brush, W. F. Hinman, and E. G. Halliday (pp. 131-140).—Standard techniques recommended by the Association of Official Agricultural Chemists were used in separating solids and liquids. Eight vegetables—aspargus, green beans, lima beans, carrots, white and yellow whole kernel corn, peas, and spinach—and seven fruits—apricots, grapefruit segments, clingstone and freestone peaches, pears, pineapples, and prunes—were studied. The chemical method of Morell for ascorbic acid was used, while thiamine and riboflavin were determined according to the method of Conner and Straub (E. S. R., 87, p. 10). The tabulated data discussed indicate that in most of the canned vegetables the solid weight which constituted 60 to 73 percent of the total can contents carried 46 to 68 percent of the ascorbic acid, 62 to 72 percent of the thiamine, and 70 to 80 percent of the riboflavin. In fruits the solid weights of the packs showed more variation, representing 46 to 67 percent of the net weights, and the vitamin percentages borne by these solids were consequently also more variable. Expressed as percent of the total, the distribution of ascorbic acid and thiamine between drained solids and liquid agreed with the weight percentages, and riboflavin distribution paralleled them at about a 5- to 12-percent-higher level.

The nutritive value of canned foods, VI-VII (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 11, pp. 752-756; 21 (1945), No. 1, pp. 7-10).—The following papers are presented in continuation of the study noted above:

VI. *Effect of large-scale preparation for serving on the ascorbic acid, thiamin, and riboflavin content of commercially-canned vegetables*, W. F. Hinman, M. K. Brush, and E. G. Halliday (pp. 752-756).—"Large-scale preparations for serving, such as had been described as typical for Army mess kitchens, were carried out in duplicate on the following eight canned vegetables: Asparagus, baked beans, green beans, lima beans, carrots, yellow corn, spinach, and tomatoes, and the retentions of ascorbic acid, thiamine, and riboflavin were determined. The effect on the vitamins of holding the cooked products hot for 1½ hr. was also investigated. The precision of the vitamin assays and its relation to retention figures are discussed. It was concluded that when all liquid is retained, ascorbic acid retention with heating is variable. It was best for tomatoes, asparagus, and spinach, ranging from 100 percent in the first two to around 80 percent for spinach. Holding these vegetables hot also caused little change in their ascorbic acid value, the change being nil for tomatoes and asparagus, and about 15 percent for spinach. Other vegetables retained from 60 down to 35 percent of their ascorbic acid during the long boiling employed in this type of preparation and showed additional variable but pronounced losses during holding over steam. If all the liquid is retained, retention of thiamine and riboflavin is practically complete for all products both during long boiling and holding over steam. When some liquid is discarded, as in serving with a slitted spoon, the loss of all of the vitamins is considerable and is directly related to their concentrations in the boiled liquid and to the proportion of liquid discarded."

VII. *Effect of small-scale preparation on the ascorbic acid, thiamin, and riboflavin content of commercially-canned vegetables*, W. F. Hinman, M. K. Brush, and E. G. Halliday (pp. 7-10).—The authors have studied two ways of small scale (household) preparation of canned foods: One, the usual procedure in which the liquid and solid are heated together and only the solid served; and two, the liquid is concentrated to from one-half to one-fourth its original volume, the solid portion added and allowed to heat, and the combined liquid and solid served. The results are tabulated and discussed. The authors conclude that "ascorbic acid loss was variable in the preparations in which liquids were concentrated, i. e., from

around 20 percent in green beans to about 60 percent in carrots. But for each vegetable prepared by both methods, the total loss was decidedly greater when the liquid was discarded. There was no loss of ascorbic acid in tomatoes, for which all of the liquid was retained but not concentrated. No thiamine or riboflavin was lost by destruction in either method, but approximately 30 to 40 percent of these two vitamins was lost when liquids were discarded."

[Dehydration studies at the Maryland station] (*Maryland Sta. Rpt. 1944, pp. 22-24*).—Dehydration trials with York Imperial, Rome Beauty, and Stayman Winesap apples gave information on the drying conditions under which the necessary low moisture content of 3-4.5 percent could be attained. Investigations showed further that low moisture content was one of the big factors contributing to the lengthening of storage life and retention of color, and that the other important factor was high sulfur content.

Comparison of dehydrated sweetpotatoes of Maryland Golden and Porto Rico varieties grown under the same conditions showed the former to give 36 percent greater total yield (and also greater yield of protein, calcium, phosphorus, and carotene) than the latter upon rehydration of equal weights of dry material.

Satisfactory drying conditions were established for obtaining dehydrated sweet corn of good quality with a moisture content of about 6 percent. It was also found that sweet corn for dehydration should be harvested at least 1 day earlier than corn for canning, and that blanching for 5-6 min. after cutting from the cob yielded a product of better flavor than that obtained by prolonged (15-20 min.) blanching on the cob.

Home fruit and vegetable dehydration, E. H. WIEGAND, F. E. PRICE, D. E. KIRK, T. ONSDORFF, and A. HOLMES (*Oregon Sta. Bul. 423 (1944), pp. 27, illus. 10*).—The construction and operation of a practical home food dehydrator is described, with accompanying detailed pictures and drawings. The preparation, dehydration, storage, and cooking of various fruits and vegetables are discussed. Fruits listed include apples, apricots, berries, cherries, cranberries, peaches, pears, prunes, and rhubarb; vegetables include asparagus, green and lima beans, beets, broccoli, cabbage, carrots, celery, corn, onions, parsnips, peas, potatoes, pumpkin, rutabagas, spinach or other greens, sweetpotatoes, tomatoes, and turnips. Tabulated data on these foods are presented, and include stage of maturity when used, method of preparation, method and length of treatment before dehydration, amount used per square foot of tray surface, approximate yield from 100 lb. fresh material—as prepared and after dehydration—drying time, drying temperature, and the condition and keeping qualities of the dehydrated product.

Data are also given listing the weight per cup of dehydrated product, the volume of water needed to reconstitute for cooking, and the recommended soaking time and cooking time of the product.

Dehydration of pumpkin and winter squash: A comparative study of forty-two varieties, C. W. CULPEPPER, J. S. CALDWELL, M. C. HUTCHINS, B. D. EZELL, and M. S. WILCOX. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr., 24 (1945), Nos. 6, pp. 170-177, 189; 7, pp. 202-208, 215*).—Twenty-one varieties each of pumpkin and winter squash were tested for their suitability and comparative quality for dehydration. Determinations of average weight per fruit, total solids, and ascorbic acid content were made upon the fresh material, and losses in preparation and dry yields were determined. The behavior of the different varieties throughout the drying process and for a number of months in subsequent storage was followed. A number of preparatory treatments were used with each variety; these included drying raw, precooking in steam, exposure to SO_2 as gas, and dipping into a water solution of SO_2 or of sodium or potassium sulfite, sodium chloride, or sodium bicarbonate prior to steaming. Drying was begun at 160° F.

and finished at 140°. The dry material was stored at 70°-75° in sealed containers, a portion of each lot in carbon dioxide and the remainder in air, for 4 mo. prior to cooking and grading. Color, general appearance, naturalness and attractiveness of flavor, consistency, and texture were the factors on which the refreshed, cooked material was graded. Eight varieties ranked as excellent, 21 as fair, while 13 rated poor. Nearly all of the varieties ranked as poor were so classed because of unattractive color in the cooked product. In general, flavor was very well preserved and all varieties were of acceptable flavor.

It is concluded that "when the factors of productiveness, ease or readiness of preparation, dry matter content (which is closely correlated with yields of dry product), color, table quality, vitamin content, and keeping quality of dry product are taken into consideration, the varieties can be arranged in order of desirability for purposes of dehydration. The 15 varieties standing highest on the list, in order of desirability, are: Golden Delicious, Boston Marrow, Banquet, Virginia Mammoth, Long Island Cheese, Mammoth Chili, Mammoth (King of the Mammoths), Cheese, Dickinson, Banana (orange type), Early Sugar, Connecticut Field, Golden Cushaw, Wisconsin Canner, and Golden Hubbard."

How to prevent discoloration of sweet potatoes, L. E. SCOTT, E. P. WALLS, and H. A. HUNTER. (Md. Expt. Sta.). (*Food Packer*, 26 (1945), No. 8, pp. 48, 50, 66, illus. 1).—In processing sweetpotatoes for dehydration, a serious discoloration is noted which appears as defects upon rehydration. This study is directed toward reasons for this discoloration and a preventive treatment for it. The following conclusions were made: "The discoloration of sweetpotatoes incident to lye peeling is prevented by preheating for 30 min. in water at 125° F., provided initial temperature of the potatoes is at least 60°. Preheating with steam for shorter periods and at higher temperatures is not as effective as water bath preheating. When lye peeled, the peeling loss is slightly greater in preheated potatoes than in those not preheated, but the trimming loss is much less in preheated material so that the over-all loss, from peeling and trimming taken together is substantially reduced. Preheating greatly reduces the amount of trimming required, and in the dehydration procedure also reduces the tedious inspection necessary to remove discolored pieces. This would mean that factory operations would be speeded up and output increased by preheating. Discoloration definitely reduces attractiveness of the reconstituted and cooked product and is definitely undesirable in either dehydrated or canned sweetpotatoes."

Preserving sliced apples by sulfuring, J. D. WINTER. (Minn. Expt. Sta.). (*Minn. Hort.*, 73 (1945), No. 8, p. 128, illus. 2).—This article describes a method of sulfuring apples, cut for use in making pies, so that they may be kept as long as 3 mo. in a cool storage place. About two level tablespoons of sulfur is required for sulfuring 5 to 10 lb. of sliced apples, which are spread 1 in. deep on trays (made of wood slats or mesh cloth), stacked an inch or two apart under a cardboard cover. One tablespoon of sulfur is placed on a thin piece of cotton about the size of the canning jar cover which holds it and the cotton is lighted, the jar cover placed underneath the cardboard box for 30 min., and the procedure repeated with another tablespoon of sulfur until the apples are exposed to the fumes for about 1 hr. The fruit is then packed in sterile earthenware jars and tightly covered with waxed paper until used.

The sulfiting of vegetables, G. MACKINNEY. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 10, pp. 300-301).—This discussion deals with the sulfiting of cabbage, carrots, and potatoes prior to dehydration and with the relationship of sulfiting to the moisture content of the finished product. Problems of applying sulfite in the tray and belt-type blanchers are discussed, and a few results of the effect of spray concentration applied on the syntron for

potatoes are given. It is concluded that sulfite has proved of distinct value in the general appearance and uniformity of the dehydrated potato since it has enabled the producer to dry to the lower and preferred moisture content of 6 percent without observed heat damage.

Freezing preservation of cooked foods, J. G. WOODROOF and I. S. ATKINSON (*Georgia Sta. Bul.* 242 (1945), pp. 15, illus. 7).—When properly prepared, packaged, and stored, a wide variety of fruits, vegetables, meats, or combination dishes may be satisfactorily cooked and frozen. Although more difficult to handle than raw foods, frozen cooked foods offer possibilities in time and labor savings and provide dishes that cannot be kept in the fresh or the canned form. Proper selection, preparation, packaging, freezing, proper cooking times and temperatures, and rapid cooling are the chief factors contributing to better quality in cooked frozen vegetables. In all cases, cooking vegetables in a closed container is preferable to other methods since volatile flavors, partially water-soluble, are retained by this method in precooking for the freezing process. Meats may be boiled, baked, or roasted before freezing, but it is recommended that fried foods not be frozen. Large cuts of meat, such as hams, shoulders, roasts, and turkeys, may be preserved in excellent condition when precooked by these methods. Frozen vegetable and meat sauces show indistinguishable characteristics from unfrozen sauces when thawed and heated (except those containing skim milk and cheese). Breads of all kinds have been kept successfully in frozen storage for many months. Pies, however, lose their crispness due to absorbing moisture upon thawing. The type of package and method of packing are important in freezing all cooked foods, and air must be excluded insofar as possible.

Freezing cooked foods, J. G. WOODROOF and I. S. ATKINSON. (Ga. Expt. Sta.). (*Food Indus.*, 17 (1945), Nos. 9, pp. 97-98, 192, 194; illus. 1; 10, pp. 105-106, 190, 192, illus. 2).—Essentially noted above.

Freezing to preserve home-grown foods, H. C. DIEHL and K. F. WARNER (*U. S. Dept. Agr. Cir.* 709 (1945), pp. 62+, illus. 33).—Procedures are given for the preparation and freezing of food in small quantities for home use. Detailed information on all phases of freezing preservation includes discussions on changes occurring in frozen foods; packaging, freezing, storage, handling, and cooking of the frozen food; preparation of meat, game, poultry, eggs, butter, and sea food; estimates of edible and nonedible products from home-dressed animals; and equipment needed for the preparation of fruits and vegetables for freezing. Twenty-two kinds of vegetables and 25 varieties of fruits are listed and directions for their preparation include information on desirable varietal characteristics, handling, preparation, packing, and use.

Freezing rates of foods in locker plants, farm freezers, and domestic frozen food cabinets, J. E. NICHOLAS (*Pennsylvania Sta. Bul.* 471 (1945), pp. 20+, illus. 13).—A general discussion is presented covering the various methods of freezing, factors which affect the rate of freezing, methods of preparation for freezing, and recommended freezing and storage temperatures.

Experimental studies were carried out on rates of freezing in farm- and domestic-type food storage cabinets and in commercial locker plants employing single-plate and air-blast methods of freezing. Data were obtained on vegetables (peas, broccoli, lima beans, and baked beans), meat (beefsteak, roasts, and ground meat), and poultry (whole and cut-up chicken). Packaging for the vegetables included pint- and quart-size cardboard containers, cube-shaped and paraffin sealed, or brick-shaped and cellophane lined. Meat and poultry were wrapped in cellophane, paper and cellophane, or paraffined paper using one to several thicknesses. Under these conditions, "the freezing interval or 'zone of maximum crystal formation' varied from 2 to 12 or more hours, depending on size of the package and number of layers

of wrapping material. In the freezing compartment the temperatures of the freezer plates and of the air were different, varying from an average of -10° to an average of -22° F."

These fluctuations in air temperature covered a complete cycle from maximum to minimum temperatures in a period of time varying from 25 min. to 4 hr. "Products which were frozen attained the temperature of the plate or of the air in the freezer within 8 to 24 hr., depending on the size of the package and the number of layers of wrapping material. With a plate temperature variation of approximately 6° , and a relatively short cycling period, the temperature of a frozen product in the freezing compartment varied less than 1° ."

Something new in frozen foods: A frozen fruit product for household jelly and jam making, R. E. Cox (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 6, pp. 169, 187).—Early in 1941, a number of frozen jam and jelly packages were prepared for study in consideration of the wide expansion of frozen foods in postwar years. A product has been developed to enable high quality jelly and jam to be made in the home by employing the simple method of thawing the frozen fruit pulp or juice (pectin and acid added before freezing), heating to boiling, adding sugar, boiling 1 min., and pouring into glasses. These mixtures of jam and jelly bases are intended to contain 25 percent soluble solids, which improves keeping quality and allows 4 level cups of sugar per 2-lb. package, yielding 64 to 68 percent soluble solids on a 1-min. boiling period (to retain color, flavor, and prevent crystallization during storage). A wide variety of flavors, the retention of normal color and flavor during freezing, and seed-free berry flavors are pointed out as special features of the frozen jam-jelly bases.

Annual review of biochemistry, XIV, edited by J. M. LUCK and J. H. C. SMITH (*Stanford University, Calif.: Ann. Rev., Inc.*, 1945, vol. 14, pp. 856+).—Among the 28 papers comprising this annual volume, the following are of particular interest with relation to the subject of nutrition: Biological Oxidations and Reductions, by H. A. Lardy and C. A. Elvehjem (pp. 1-30) (Univ. Wis.); Enzymes that Hydrolyze the Carbon-Nitrogen Bond: Proteinases, Peptidases, and Amidases, by D. M. Greenberg and T. Winnick (pp. 31-68); Nonproteolytic, Nonoxidative Enzymes, by H. Lineweaver and E. F. Jansen (pp. 69-90) (U. S. D. A.); The Chemistry of the Carbohydrates, by C. D. Hurd (pp. 91-112); The Chemistry of the Lipids, by H. E. Longenecker and B. F. Daubert (pp. 113-144); The Chemistry of the Amino Acids and Proteins, by J. Steinhardt (pp. 145-174); The Chemistry of the Nucleic Acids and Nucleoproteins, by J. M. Gulland, G. R. Barker, and D. O. Jordan (pp. 175-206); X-ray Studies on Compounds of Biochemical Interest, by I. Fankuchen (pp. 207-224); The Chemistry of the Steroids, by W. L. Ruigh (pp. 225-262); The Chemistry and Metabolism of the Compounds of Sulfur, by J. W. II. Lugg (pp. 263-282); The Chemistry and Metabolism of the Compounds of Phosphorus, by H. M. Kalckar (pp. 283-308); Carbohydrate Metabolism, by J. A. Russell (pp. 309-332); Fat Metabolism, by E. F. Gildea and E. B. Man (pp. 333-356); The Metabolism of Proteins and Amino Acids, by P. P. Cohen (pp. 357-382) (Univ. Wis.); The Chemistry of the Triterpenes, by C. R. Noller (pp. 383-406); Mineral Metabolism, by J. Sendroy, Jr., (pp. 407-430); Nutrition, by F. J. Stare, D. M. Hegsted, and J. M. McKibbin (pp. 431-468); Water-Soluble Vitamins, by L. C. Norris and G. F. Heuser (pp. 469-524) (Cornell Univ.); and Fat-Soluble Vitamins, by J. C. Fritz (pp. 525-560).

[Protein nutrition in health and disease] (*Jour. Amer. Med. Assoc.*, 127 (1945), Nos. 15, pp. 985-989; 16, pp. 1052-1055; 17, pp. 1101-1107, illus. 4; 128 (1945), Nos. 2, pp. 95-100; 4, pp. 283-287; 5, pp. 360-362; 6, pp. 439-441; 8, pp. 590-593; 9, pp. 659-664).—This series of articles, discussing the significance of protein nutrition in health and disease, includes the following papers: Protein:

Its Role in Human Nutrition, by F. J. Stare and C. S. Davidson (pp. 985-989); Importance of Adequate Protein Nutrition in Pregnancy, by P. F. Williams (pp. 1052-1055); Protein Deficiencies in Pregnancy, by R. E. Arnell, D. W. Goldman, and F. J. Bertucci (pp. 1101-1107); Protein in Surgery, by C. C. Lund and S. M. Levenson (pp. 95-100); Protein Nutrition in Pediatrics, by S. Z. Levine (pp. 283-287); The Importance of Proteins in Resistance to Infection, by P. R. Cannon (pp. 360-362); The Clinical Detection of Protein Deficiency, by J. B. Youmans (pp. 439-441); Selection of Protein Containing Foods to Meet Protein Requirements, by D. F. Turner (pp. 590-593); and The Practical Use of Amino Acids in Protein Nutrition, by R. Elman (pp. 659-664).

Study of the nutritional quality of dietaries by chemical analysis, E. E. LOCKHART, R. S. HARRIS, E. W. TAPIA, H. S. LOCKHART, M. K. NUTTER, V. TIFFANY, and A. H. NAGEL (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 11, pp. 742-746).—The thiamine, riboflavin, niacin, ascorbic acid, calcium, and iron contents of 3 complete meals normally eaten by 71 subjects were determined by chemical analysis. An attempt was made to obtain a distribution in the age, sex, activity, and economic status of the subjects similar to that of the Nation as a whole. When measured in comparison to the recommended dietary allowance of the National Research Council, the diets showed the average daily intake of ascorbic acid, calcium, and iron to be adequate, whereas the thiamine, riboflavin, and niacin values were low. Tabulated data indicate the percent adequacies of the diets in relation to sex and various age groups. The authors note that the thiamine, riboflavin, and niacin values of the meals were approximately 70 percent and the ascorbic acid values about 50 percent as high by actual analysis of the samples as they would have been had they been calculated from representative food tables giving values for average portions on the raw food basis.

The development of dietary standards, L. B. PETT, C. A. MORRELL, and F. W. HANLEY (*Canad. Jour. Pub. Health*, 36 (1945), No. 6, pp. 232-239, illus. 1).—This paper presents briefly an account of events leading to the establishment of dietary standards, discusses briefly the role and specific uses of dietary and nutritional standards in applied nutrition, and suggests that "data on human requirements for various nutrients should be assembled, as they become available, in frequency tables. From these may be derived distribution curves representing a whole population provided a proper sample was used. Probability tables could then be prepared indicating that a person with a characteristic nutrient intake has, for example, a 5 percent or a 95 percent chance of showing a given set of medical signs. This would be most useful for physicians and others, and would be preferable to the present method of ascribing 'deficiency' to anyone with an intake of less than 75 percent or 50 percent of an arbitrary figure."

What rural Texans eat, J. WHITACRE. (Tex. Expt. Sta.). (*Jour. Home Econ.*, 37 (1945), No. 3, pp. 149-150).—A full report of this study appeared in Texas Station Bulletins 642 and 643 (E. S. R., 91, pp. 770, 771).

Nutrition in Brazil, C. C. MASCARENHAS (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 1, pp. 11-12).—Food patterns vary considerably with the geographical picture in the five principal regions. The Amazon Basin has a hot, humid climate and huge forests, and the basic foods consumed there are manioc meal, beans, Brazil nuts, powdered or condensed milk, game, and fish. The Northeastern Coast has a dry climate and the main foods consist of dried salt meat, beans, manioc root and meal, and fruits (papayas, pineapples, oranges, etc.). The Northeastern Central Highlands has a semiarid climate, and the basic foods are comprised of goat's milk and meat, dried salted meat, beans, corn, and molasses. The Central Hills (including the Paraguay and Paraná basins) have a temperate climate and the diet used is more varied, being composed of beef and pork, cheese, beans, corn, rice, vege-

tables, and fruits (mainly orange, bananas, and mangoes). The Southern Hills possess more highly developed agriculture and industry and a temperate climate; basic foods are beef, beans, manioc root and meal, cheese, milk, vegetables, and fruit. In general, lard is extensively consumed, although some regions use palm and dandé oil (both rich in carotene). Sugar, molasses, and cake are used in large quantities; fish is abundant and numerous varieties (167 or more) available. Large quantities of Brazil nuts, considered highly nutritious, are eaten; and manioc meal (prepared by pulverizing the root, extracting the starch with water, and drying) is extensively used although its food value is very low. Salt is consumed in liberal amounts because of the heat. Milk consumption is generally low (averaging 240 gm per day). Pathological studies indicate frequent occurrence of goiter in the Central Hills, and prevalence of hypochromic microcytic anemia except in those few regions where large amounts of meat are consumed. Rickets occurs rarely. Judging by present nutritional standards, decreased resistance to infection, and incidence of tuberculosis, nutritional inadequacy (mainly subclinical deficiencies) is marked throughout the country. Acute nutritional deficiencies are rare.

The effects of dietary deficiencies upon the oral structures, I. SCHOUR and M. MASSLER (*Physiol. Rev.*, 25 (1945), No. 3, pp. 442-482; also in *Jour. Amer. Dent. Assoc.*, 32 (1945), Nos. 11, pp. 714-727; 13, pp. 871-879; 15, pp. 1022-1030; 17, pp. 1139-1141).—This extensive review with 286 literature references summarizes the findings as follows:

The oral structures show early and characteristic changes in response to nutritional disturbances. Nutritional studies, therefore, should include gross and histologic examination of (1) the enamel and dentin, (2) the periodontal structures (gingivae, cementum, periodontal membrane, and alveolar bone), (3) the tongue, (4) the lips, and (5) the oral mucosa. "The type of response varies with the particular dental or oral structure and its stage of development, with the specific nutritional disturbance, and with the species studied. The growing and calcifying enamel and dentin serve as a kymographic biologic record of the nutritional status of the individual and are especially sensitive to calcium, vitamins A, C, and D, and fluorine. The fully formed and calcified enamel and dentin are no longer influenced by calcium metabolism. They contain the nutritional record of the past. The completed enamel is exposed to the oral fluids and oral flora and is beyond the pale of systemic nutritional influences. It is essentially devoid of an internal environment and is influenced by the latter only indirectly and to the extent that the oral milieu may be modified through systemic changes in the saliva or in the oral epithelium. The soft oral structures—the oral mucosa, the tongue, the lips, the gingivae, and the periodontal membrane—which grow throughout life reflect the nutritional status of the present in both the young and the old individual and are especially sensitive to vitamins B, A, and C. The alveolar bone, which also grows throughout life, responds particularly to disturbances in mineral metabolism and offers the advantage of radiographic examination.

"Our knowledge of the effect of nutritional disturbances on the oral structures is derived from both experimental and clinical observations. Most of the evidence on the delicate response of tooth development to nutritional disturbances is derived from animal experimentation, especially from rodents. Their incisors are of continuous growth and serve as ideal test objects for the analysis of growth, calcification, and eruption. Where clinical data are not available, it cannot be assumed that the oral structures in man are equally sensitive, either qualitatively or quantitatively. There are considerable anatomic and physiologic differences in the dental apparatus of the rat, guinea pig, dog, and other species. The findings on the response of the soft oral tissues are derived largely from clinical observations in man. This is especially true of the effects of vitamin B deficiency. The experi-

mental and microscopic oral changes in this deficiency await further investigation. Present evidence has not established a specific nutritional basis for caries or for periodontal disease. Dental disease may be caused or aggravated by nutritional deficiencies and in such cases cannot be treated successfully unless the nutritional condition is recognized and corrected. The physical character of the food, through its cleansing action on the enamel surface and its stimulating action on the gingivae, is a significant dietary factor in caries and periodontal disease. Caries is largely a problem of food decomposition in the oral cavity rather than of gastrointestinal absorption. The effects of proteins, fats, and carbohydrates upon the teeth and surrounding tissues merit further investigation. Routine examination of the oral structures offers an accurate index to the state of nutrition of the individual."

Blood regeneration in women blood donors.—I, Effect of generous amounts of meat and milk in the diet, R. M. LEVERTON, T. J. McMILLAN, and M. PETERS. (Nebr. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 11, pp. 747-751, illus. 1).—Seventeen healthy young women served as blood donors and subjects in a study to compare the effect on blood regeneration of a daily intake of 50 gm. protein with one of 75 gm. The basal diet used in the controlled dietary regimen, maintained for 2 weeks prior to and 45 days following the blood donation, supplied daily 0.9 gm. protein per kilogram body weight (50 gm. per 56 kg. woman), 8 mg. iron, and an adequate supply of other nutritional essentials. Those receiving the liberal protein diet after donation had supplements of meat or of milk and cheese. Freely chosen diets were allowed after the forty-fifth day. Blood tests were carried out 1 or 2 days before donation and at intervals of 7, 14, 21, 28, 38, 45, and 67 days after donation.

Blood values measured on the seventh day were alike in both groups and showed a decrease resulting from the withdrawal of 500 cc. of blood. Beginning with the fourteenth day, all figures except those for serum protein were slightly but consistently higher when the subjects were receiving additional amounts of meat and milk than when no supplement was given. At the end of 45 days on either experimental diet, serum protein was the only value which had returned completely to the donation level. At 45 or 67 days, the red cells were smaller and their hemoglobin content less than was the case in the predonation test, but at the 75-gm. protein level there was significantly greater hemoglobin regeneration within the newly formed cells than at the 50-gm. level, the hemoglobin recovery, calculated as percentage of that withdrawn in the 500 cc. blood, amounting in 14 days to 13.2 and 6.1 percent at the 75- and 50-gm. levels of protein intake, respectively; at the end of 45 days, the recoveries were 38.2 and 18.2 percent, respectively; and at 67 days (after the subjects had gone back to freely chosen diets for 3 weeks), 44.1 and 12.1 percent. The level of protein intake following blood donation did not affect the concentration of total serum protein, nonprotein nitrogen, or the albumin : globulin ratio of the blood. In fact, the serum protein level was 95-96 percent of the donation value within 7 days, indicating a mobilization of protein reserves into circulating plasma. The replacement of iron in the blood as measured by hemoglobin formation did not proceed as well as that of serum protein.

"The better general performance in blood regeneration of the subjects when on the higher protein intake as compared with the lower is probably not so significant as the fact that even on the liberal protein intake of 75 gm. daily, together with an adequate supply of other nutritional essentials, these healthy young women did not completely replace within 45 days all of the hemoglobin lost by the withdrawal of 500 cc.—a routine blood donation. When they returned to self-chosen diets for 6 weeks, the hemoglobin values increased from 92 to 95 percent of the donation value by the end of the first 3 weeks, then remained almost stationary, and were 96 percent at the end of 6 weeks. When the subjects had not had the additional

protein for 45 days following the donation, the self-chosen diets brought about no increase by the end of 3 weeks and it is unlikely that an increase would have occurred at the end of 6 weeks."

The need for the woman donor to select a diet that will furnish at least 75 gm. protein daily is stressed.

Effect of storage conditions on the vitamin content of whole milk powder (*Maryland Sta. Rpt. 1944, p. 17*).—Samples of whole milk powder stored for 12 mo. at 20° C. showed an average decrease in vitamin A of 22.6 percent; at 30°, 24.8 percent; and at 37°, 50.2 percent. The corresponding average decrease in carotene at these temperatures was 19.7, 34.3, and 36.5 percent, respectively. The most rapid decrease took place between the ninth and twelfth months. There was no decrease in riboflavin at any temperature studied during the 12 mo. It is concluded that for greatest conservation of vitamin A and carotene in spray-dried whole milk powder, the product should be stored at temperatures not in excess of 20° C. and should be consumed within 3 mo. after being stored.

Vitamin content of dehydrated foods: Effect of packaging and storage, D. G. HEBERLIN and L. E. CLIFCORN (*Indus. and Engin. Chem.*, 36 (1944), No. 10, pp. 912-917, illus. 6).—Eleven dehydrated fruits and vegetables obtained from commercial production lines were packed in conventional hermetically sealed metal containers in an atmosphere of air, carbon dioxide, or nitrogen, or in a 3-ply craft paper-lead foil-cellulose envelope, heat sealed and enclosed in a paper carton. Units of each of the packages were stored at room temperatures (75°-80° F.), 98°, and 130°, the paper packages being held at 93 percent relative humidity. Representative samples from each lot were withdrawn as placed in storage, and at intervals of 2 weeks and 1, 2, 3, 6, 9, and 12 mo., and examined for quality and content of ascorbic acid (total and reduced), carotene, thiamine, and riboflavin. This communication presents graphs showing the effects of storage atmosphere, storage temperature, and storage time on the several vitamin values. These curves showed that the storage atmosphere exerted no significant effect on thiamine or riboflavin, but that the retention of ascorbic acid and carotene was favored by the inert storage atmosphere (CO₂ or N₂) at room-temperature storage. With increasing storage temperature, however, the protective effect of the inert gas was greatly reduced, particularly with ascorbic acid. Higher storage temperatures greatly lowered the ascorbic acid retention and decreased that of thiamine in most products, and somewhat adversely affected the carotene values; riboflavin in dehydrated vegetables appeared to be quite stable regardless of the storage temperature. The commercially dehydrated beets, cabbage, and carrots subjected to further drying in an experimental dehydrator to reduce their moisture content another 1-1.5 percent showed no better vitamin retention than the original commercial products, with the possible exception of better thiamine retention in cabbage.

At higher storage temperatures and after long storage periods, significant quantities of materials interfering with the ascorbic acid determination developed. The Roe dinitrophenylhydrazine method for dehydroascorbic acid was tried with results of questionable significance. Interferences were noted in the thiamine determinations of beets and onions, and increases in apparent carotene were noted in some of the samples of carrots after 1 yr. of storage.

The comparative value of different test organisms in the microbiological assay of B vitamins, L. H. LEONIAN and V. G. LILLY (*West Virginia Sta. Bul. 319* (1945), pp. 35, illus. 9).—By using several microbiological methods in assaying each vitamin, the authors have attempted to fulfill two objectives: First, to distinguish between the vitamin effect per se and the "vitamer" or "isotel" effect; second, to bring together and to extend the more promising methods of microbiological assay. A compilation of these methods is given, and basic principles and

modifications in technic are described. A commercial sample of dry yeast provided the test material, and aliquots for assay were prepared by acid hydrolysis, or autolysis and acid hydrolysis combined.

Of the four test organisms used to assay pantothenic acid, *Proteus morganii* gave the lowest value (37 µg. per gram of yeast), while *Lactobacillus casei*, *L. arabinosus*, and *Saccharomyces cerevisiae* "Gebrüder Mayer" assayed nearly twice as much pantothenic acid (61–65 µg. per gram) as *P. morganii*. The authors presume this response to be due to some "vitamer" of pantothenic acid. For the other vitamins studied they conclude as follows:

"*S. carlsbergensis* yielded the lowest assay values for pyridoxin, 9.9 µg. per gram of yeast as against 16.8 for *Neurospora sitophila*; 20–27 for *Ceratostomella montium*, *C. pleurionulata*, and *Mycoderma valida*: 270 for *L. casei*; and from 6,500 to 7,600 µg. for *Streptococcus lactis* R, *Leuconostoc mesenteroides*, and *L. arabinosus*. This indicates the presence in yeast of more than one 'vitamer' of pyridoxin. The 13 test organisms used to assay biotin gave figures varying from 0.16 to 0.58 µg. per gram. The avidin-uncombinable portion varied from 0.03 to 0.25 µg. per gram, showing that this portion also consists of more than one substance. When substances other than yeast were assayed for biotin, the test organisms failed to maintain the same order in their assay values; those giving low values for yeast yielded high figures, and those that give high values, yielded low figures. This shows that there are not only biotin vitamers of different quality as well as quantity, but perhaps diverse biotin isomers in different substances. *Pythium ascophallon*, *Phycomyces blakesleeanus*, and *S. cerevisiae* 'Old Process' assayed about 500 µg. of thiamine per gram of yeast. In case of processed foods where there might be degradation products of thiamine, *Pythium ascophallon* should be preferred because it responds only to the thiamine molecule; otherwise, *Phycomyces* is the most satisfactory. *L. casei*, *L. arabinosus*, *Leuconostoc mesenteroides*, and *Zygosaccharomyces marxianus* assayed about 300 µg. of nicotinic acid per gram of yeast and seem to be equally satisfactory. *N. crassa* 'p-aminobenzoicless' strain and *L. arabinosus* assayed about 45 µg. of this vitamin per gram of yeast."

S. cerevisiae Old Process and *N. crassa* "inositolless" gave inositol values of 1,333 and 1,605 µg. per gram of yeast. The response of *N. crassa* to inositol seemed specific, as in the absence of inositol no growth of the fungus occurred regardless of the size of inoculum used or the time of incubation. A riboflavin value of 73 µg. per gram of yeast was found by using *L. casei* as the test organism. "The application of microbiological assay methods to the vitamer situation is discussed with especial reference to pyridoxin and biotin."

Ascorbic acid, thiamin, and riboflavin retention in fresh spinach in institution food service, K. L. CUTLAR, J. B. JONES, K. W. HARRIS, and F. FENTON. ([N. Y.] Cornell Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 11, pp. 757–760).—The lots of garden-fresh spinach used in these studies contained 45–76 mg. ascorbic acid, 0.10–0.13 mg. thiamine, and 0.20–0.23 mg. riboflavin per 100 gm.; the various shipments of market-fresh spinach contained 13–81 mg. ascorbic acid, 0.08–0.13 mg. thiamine, and 0.17–0.25 mg. riboflavin per 100 gm. The New York spinach obtained on the market from October 21 to December 8 had a higher ascorbic acid content (44–81 mg.) than some of the Texas shipments (13–77 mg.) which were iced for shipment and arrived on the New York market from December 15 to April 15; regional differences were not apparent in the thiamine and riboflavin values.

A large increase in the amount of cooking water above the amount required to cover the spinach as it began to cook in steam-jacketed kettles decreased the retention of ascorbic acid. Thus, a 15-lb. lot of spinach cooked with 32 qt. water in the 40-gal. kettle retained 40 percent of its ascorbic acid, as compared with a 50 percent retention in the lot cooked with 8 qt. of water in a 25-gal. Kettle. Boiling this

amount of spinach in 8 qt. of water in a 16-gal. stockpot on top of a gas range resulted in a retention of only 32 percent of the ascorbic acid; use of a smaller amount of water (2 qt.) did not result in higher retention either with this type of range or with the U. S. Army field range, since the use of the small quantity of water necessitated a longer cooking period. With both types of equipment (steam-jacketed kettle and open stockpot) and a moderate amount of water, about 20–24 percent of the ascorbic acid went into solution, but when the water was increased four-fold, about 40 percent dissolved in the cooking water. Increasing the quantity of spinach boiled at one time in the steam-jacketed kettle decreased the ascorbic acid retention; in 5-, 15-, and 30-lb. lots cooked in the steam-jacketed kettle (proportional amount of water used), retentions decreased from 67 to 50 to 39 percent (with only 21–27 percent going into solution), while 5- and 15-lb. lots boiled in the stockpot on a gas range retained only 53 and 32 percent, respectively (solution losses 19 and 23 percent). These tests showed that better retention of ascorbic acid resulted by cooking in the steam-jacketed kettle than in the stockpot on top of the range. In other tests, the pressure-type steamer was found to be as satisfactory as the steam-jacketed kettle in retaining the ascorbic acid value of the spinach, and possibly somewhat better in retaining the thiamine and riboflavin content. Approximately 80–85 percent of the thiamine and 80–95 percent of the riboflavin were retained in the cooking trials using 15-lb. lots of spinach.

Drained cooked spinach lost ascorbic acid when held in a heated food service unit at 150° F., the amounts retained dropping from 85 to 61 to 26 percent in holding periods of 15, 30, and 120 min., respectively.

Ascorbic acid in evaporated milk, D. V. JOSEPHSON and F. J. DOAN (*Pennsylvania Sta. Bul.* 473 (1945), pp. 22+, illus. 5).—Continuing their previous experiments (E. S. R., 92, p. 598), the authors have studied the effects of fortification using levels of 50 and 100 mg. per liter of ascorbic acid. Certain experiments using underfilled cans (12.5 oz. instead of 14.5 oz.) demonstrated that increased amounts of oxygen produced the greatest losses of ascorbic acid under comparable storage conditions. Normally sealed cans gave intermediate results, while vacuum- or nitrogen-sealed cans showed the highest retention of ascorbic acid. Cans were stored at 7° C., room temperature (24°), and 37° for a period of 1 yr. Assays were made before and after sterilization and at regular monthly or bimonthly intervals.

Results confirmed the authors' previous findings and indicated that commercially manufactured evaporated milk could be fortified satisfactorily with 50 to 100 mg. per liter of ascorbic acid. If processed by sealing under vacuum and stored at low temperatures, the canned milk, after 3 months' storage, could retain 84–90 percent of the original ascorbic acid present. Loss of ascorbic acid increased with length of storage, temperature of storage, and amount of oxygen present in the can. Little or no dehydroascorbic acid was found in evaporated milk after sterilization or during storage.

Heat-generated reducing substances, produced during the sterilization process, tended to disappear during the first 2 mo. of storage and then increased progressively with the time and temperature of storage. Natural aging of the milk was accelerated by increases in storage temperature, and was typified by higher flavor, darker color, greater salt deposit, and a lower pH.

The destabilization of protein which occurs during sterilization of milk was increased by high level fortification with ascorbic acid (100 mg. per liter). The use of sodium-l-ascorbate, or the addition of sodium citrate, sodium carbonate, or disodium phosphate counteracted this effect.

Concentrated milk fortified and held 24 hr. at 40° F. in tinned containers, prior to sterilization, showed no loss of ascorbic acid during this period.

Properly processed milk fortified with 50 mg. per liter of ascorbic acid exhibited good stability when used in infants' formulas. Even when kept for 72 hr. after preparation, less than 30 percent loss was observed. The authors suggest that milk thus fortified might be an excellent source of ascorbic acid in infant feeding.

Effect of modified atmosphere storage on ascorbic acid content of some vegetables, H. PLATENIUS and J. B. JONES. (Cornell Univ.). (*Food Res.*, 9 (1944), No. 5, pp. 378-385).—In these storage tests in which wide-mouthed glass jars with tightly fitting lids served as storage chambers, the vegetables were held in the dark in constant temperature rooms at temperatures from 10° to 24° C.

Reduction in the oxygen content of the storage atmosphere resulted in lowering the rate of ascorbic acid loss, although the effectiveness of the treatment varied with different vegetables, the level of O₂, and the temperature of the storage room. With asparagus and spinach, which gave best response to modified storage, the retention of ascorbic acid at O₂ concentrations below 4 percent was from 2.6 to 4 time as high as in comparable samples stored in normal air; the effectiveness of the treatment decreased somewhat with a lowering of the temperature.

CO₂ in concentrations as high as 20 percent added to an atmosphere containing small proportions of O₂ inhibited losses of ascorbic acid in broccoli and Brussels sprouts regardless of the temperature, accelerated the destruction in asparagus and spinach at room temperatures but retarded it at 10°, and had a detrimental effect on peas at both temperature levels. "The data furnished additional evidence for the statement that vegetables held in cold storage, common storage, or outdoor bins require only a minimum of ventilation. At temperatures commonly employed for the storage of vegetables, a lowered O₂ concentration and increased CO₂ content of the air has a beneficial instead of detrimental effect. Ventilation for vegetables in storage is needed only to remove heat during the beginning of the storage period and to prevent the complete utilization of oxygen by respiration."

It is considered doubtful whether storage of vegetables under a controlled modified atmosphere will find commercial application because of the cost of constructing gas-tight storage rooms and maintaining the desired gas composition, and because such storage still does not eliminate bacterial spoilage.

Some factors affecting the ascorbic acid content of chile, E. M. LANTZ (*New Mexico Sta. Bul.* 324 (1945), pp. 14).—Experiments on varietal differences in peppers, previously reported (E. S. R., 89, p. 774), have been expanded. Studies were made on the influence of maturity, soil, season, time of day of harvest, and holding time on the ascorbic acid content of chili peppers.

Two varieties of Hungarian paprika, grown under comparable conditions, showed ascorbic acid values of 180 mg. and 166 mg. per 100 gm. fresh weight. Similarly, the College No. 9 variety of chili pepper was compared with the Anaheim variety, and was found to contain more ascorbic acid on both fresh weight and dry weight basis (257.7 mg. v. 191.0 mg. per 100 gm. fresh weight and 2,120 v. 1,824 mg. per 100 gm. dry weight). Peppers grown in sandy soil showed a somewhat higher ascorbic acid content, on the fresh weight basis, than those grown in heavy soil, but this difference was eliminated when dry weight comparisons were made. Time of day and amount of sunlight slightly influenced the ascorbic acid content, highest value being obtained when the peppers were picked between noon and 2 p. m. on hot sunny days. Seasonal influence was of greater importance; green peppers gathered in September and October were often 50 percent higher in ascorbic acid than those picked in July or August. Analysis of different parts of unevenly ripened fruits showed appreciably higher ascorbic acid values in the riper portions. Ripe peppers assayed immediately after harvesting and after 24 hr. and 72 hr. storage at room temperature showed losses, due to storage, amounting to 35 percent and 44 percent, respectively.

Ascorbic acid retention in Florida grapefruit juices, I-III. (U. S. D. A. et al.). (*Canner*, 98 (1944), No. 9, pp. 24-26; 100 (1945), Nos. 8, pp. 55-57; 23, pp. 12-14, 23).

I. *During commercial canning*, E. L. Moore, E. Wiederhold, C. D. Atkins, and L. G. MacDowell.—The juices examined in the survey conducted between March 31 and April 27, 1943, were those produced in the commercial canning season in 12 central Florida canning plants. Equipment for sampling the juices at successive stages of commercial operation was taken into plants where the ascorbic acid analyses were made, essentially by the method of Bessey and King (E. S. R., 71, p. 137). The dye solution was standardized against ascorbic acid, which in turn was checked against iodine. Ascorbic acid in the freshly extracted unsweetened juices (a total of 60 samples taken at several different times in each plant) ranged from 36.0 to 42.1 mg. per 100 cc. and averaged 39.1; in the juices as canned in plain tin cans, values ranged from 32.1 to 41.4 mg. per 100 cc. and averaged 37.9. The average retention of ascorbic acid in the canning operation was about 97.0 percent.

II. *During storage of the canned products*, E. L. Moore, E. Wiederhold, and C. D. Atkins.—In each of the 12 plants, four samples of canned juices were taken at each follow-through of the canning process. One sample was cooled immediately to room temperature and tested at the canning plant for vacuum, head space, total acidity (as an index of uniformity of sampling), and ascorbic acid. The other three were brought back to the laboratory to be tested at the end of 2, 4, and 6 months' storage at room temperature, averaging about 78° F. The results indicated an average retention of ascorbic acid in the canned unsweetened grapefruit juices from these 12 plants of 95 percent at the end of 2 mo., 90 percent at the end of 4 mo., and 83 percent at the end of 6 mo.

III. *As related to individual factors of canning plant operation*, E. Wiederhold, C. D. Atkins, and E. L. Moore.—Factual information on the raw product and the canning plant equipment and procedure was recorded on previously prepared record forms at the time the samples were taken at the plants. This information, later studied in relation to the ascorbic acid values for the fresh, canned, and stored samples, suggested that the following factors contributed most to the good retention of ascorbic acid in canned grapefruit juices both during processing and subsequent storage: "(1) Absence of copper or other metal that might tend to catalyze the oxidation of ascorbic acid in the juice; (2) avoidance of unnecessary incorporation of air in juice during any step in processing, such as extraction, screening, filling of holding tanks, and storage of juice in these tanks; (3) thorough deaeration of juice; (4) use of tubular flash pasteurizers rather than kettle-type pasteurizers; (5) high vacuum in cans and reduction of head space to a practical minimum; and (6) cool storage temperature—a storage temperature of 40° F. has given excellent retention of ascorbic acid in canned citrus juices."

TEXTILES AND CLOTHING

Testing cloths for tensile strength: Practical details in testing cloths for tensile strength (*Jour. Textile Inst.*, 36 (1945), No. 2, pp. S1-S14, illus. 3).—This account deals with the practical points from the reception of the sample to the breaking of the specimen on the machine. The first part, dealing with the preparation of the specimens, is concerned with the number of specimens and their location in the sample, dimensions of strips, the marking of strips and specimens, detachment of the strips from the sample and their conversion into specimens, and the conditioning of specimens. The second part deals with the testing of specimens and the calculating of results. The discussion is based on the use of the Goodbrand Type C cloth-testing machine, so that many of the factors considered are peculiar

to the horizontal machines of this type although some are of more general application. Consideration is given to range and rate of traverse of machine, general condition of the machine, calibration, and the actual testing of a specimen. The appendix gives details of the extended method of calibration and gives practical notes concerning friction in the machine.

The story of coated fabrics.—I, Development of oilcloth. II, Rubber and pyroxylin coatings, F. J. TUTTLE (*Textile Res.*, 14 (1944), Nos. 7, pp. 228-232, illus. 8; 8, pp. 260-269, illus. 6).—These articles present an account of the current practices in the making of these coated fabrics, and of the research that furnished the background for these technics.

The deterioration of cotton fabric by certain micro-organisms, D. E. KLEMME, G. A. GREATHOUSE, K. BOLLENBACHER, and S. POPE (*U. S. Dept. Agr. Cir.* 737 (1945), pp. 11, illus. 5).—Elaborating upon the previous experiments of Greathouse et al. (*E. S. R.*, 88, p. 716; 92, p. 807), the authors have extended these studies to include a wide number of cellulose-decomposing fungi. Results indicated that "most of the organisms utilized show a specific relation in their nutritive reactions in respect to fabric deterioration, and within these limitations are adaptable as test organisms."

"Twenty-nine fungi out of the 43 isolates studied caused more than 50 percent loss in breaking strength of a cotton duck when incubated 7 days on a liquid mineral-salt medium containing ammonium nitrate as nitrogen source. The one bacterium used, *Spirochaeta cytophaga*, decreased the strength of the fabric by 76 percent on the same medium. The loss in strength caused by the various fungi ranged from 97 percent for one strain of *Metarrhizium glutinosum* to no loss for *Aspergillus niger*. The other strains of *M. glutinosum* produced 94 and 84 percent loss. *Stachybotrys atra*, *Chaetomium globosum*, one isolate of *Trichoderma*, one of *Thielavia terricola*, one of *Cephalosporium*, and *Fusarium oxysporum* deteriorated the fabric 88, 86, 86, 81, 81, and 73 percent, respectively, on the nutrient containing ammonium nitrate.

"*Chaetomium globosum*, the 12 isolates of *Fusarium*, the 3 of *M. glutinosum*, and *S. cytophaga* were grown also on mineral-salts media containing (1) sodium nitrate and (2) ammonium dihydrogen phosphate as nitrogen sources. One species of *Hormodendron* was grown on the sodium nitrate but not on the ammonium phosphate medium. In general, the *Fusarium* isolates produced the greatest amount of deterioration on the ammonium phosphate medium and the least on the sodium nitrate. The fungi belonging to the other genera and *S. cytophaga* caused more damage to the fabric on the ammonium nitrate nutrient than on the other media, except for *C. globosum*, which caused the greatest loss in breaking strength on the sodium nitrate medium."

HOME MANAGEMENT AND EQUIPMENT

Housing conditions in rural Pennsylvania, A. T. WINK (*Pennsylvania Sta. Bul.* 472 (1945), pp. 31+, illus. 20).—Based on population centers of 2,500 or less and individual housing units located in the open country of Pennsylvania, a study was made to determine the adequacy of rural housing. Pennsylvania rural housing ranked favorably when compared with that of other sections of the United States; a higher proportion of rural homes were equipped with running water, bathrooms, gas, and electrical appliances. However, this State had a higher percentage of old houses in need of repair. Tables are given that show deficiencies in rural housing; these deficiencies are listed by specified items, such as space per person, structural repair, age of the house, and size and occupation of family. Methods of scoring are discussed in an appendix.

Research in work simplification: Washing a door, preparing a head of lettuce, cleaning spinach, I. H. GROSS and E. EVERETT. (*Mich State Col.*). (*Jour. Home*

Econ., 37 (1945), No. 3, pp. 159-163).—This article deals chiefly with generalizations and implications based on 25 observations made on homemaker groups to study the use of the left hand in doing monotonous household tasks and to determine a means of obtaining data on such performances. A study of the tasks was accomplished through observations of homemakers in their own homes and micromotion film analysis. The time required, the number of delays, and the operations used in household tasks, including washing a door, cleaning spinach, and preparing lettuce, showed a definite relationship. The ratio of operations to delays remained similar throughout all tasks, 2.0 to 2.9 times as many operations as delays, and the left hand performed from one-third to one-half of the total number of operations. This led observers to believe that in a number of instances there were useless motions of the left hand following the same path of motions as the right hand. Experience of the housewife, equipment and layout, and materials were additional factors which assumed relative importance in the speed of the tasks.

Electrical toast-making, P. B. POTTER and E. E. BILLER (*Virginia Sta. Bul.* 374 (1945), pp. 22, illus. 4).—This investigation presents a study of the factors involved in toast making. Tests were made on 18 different electric toasters of different makes and models, including the more expensive toasters with automatic timers and thermostats to regulate the time of exposure of the bread to the heat, and lower priced models depending on the operator to use the correct timing to secured the desired product.

Most of the toasters were well constructed, and all of them applied heat to the surface of the bread, held in a vertical position, by radiation from a pink-hot electrical element. Constant heat application throughout the tests was insured by adjusting the operating electric circuit to 115 v. by means of a rheostat and voltmeter. Timing was exact because of an electric clock which was plugged into the circuit with the toaster. The temperature at the approximate toast surface was measured by means of a thermocouple fastened to the guard wires of the toaster and connected to a pyrometer outside; and energy consumption was measured by a special meter reading to the hundredths of a kilowatt hour.

Throughout the tests, in which some 2,500 pieces of toast were made from a standard commercial bread, it was apparent that the intensity of the heat striking the bread surface was an important factor in toasting, but that temperatures produced by different toasters and even by the same toaster were variable, thus indicating rather poor performance on the part of the toasters. No one optimum temperature could be selected, although one of about 400° F. appeared to be more nearly correct. It was concluded that good toasting resulted from a combination of temperature, distance, and timing rather than from any definite temperature. The various toasters required 50-96 sec. to make 2 slices of toast, with an average of 72 sec. for all tests. Light toast required 8 sec. less, and dark toast 12 sec. more than medium toast, indicating the necessity for careful timing. Energy consumption for making 2 slices of toast was exceedingly small, varying from 0.010 to 0.022 kw. hr. It was estimated that an expenditure of 3½ ct. would cover the cost of making 6 slices of toast a day for 30 days. The bread lost from 11 to 23 percent of its weight in the toasting process, with an average of about 16 percent. A tabulation of the data on the various toasters in comparison with judges' scores on the toast showed such variability in the figures that no definite conclusions could be drawn as to what constituted proper conditions for toast making. It was apparent, however, that it was possible with careful watching to make as good toast in a toaster without a timing control as in the more expensive models with thermostats or a timer for control.

REPORTS AND PROCEEDINGS

A summary of wartime research: Fifty-seventh annual report of the [Maryland] Agricultural Experiment Station, 1943-1944, W. B. KEMP (*Maryland Sta. Rpt. 1944, pp. 40+*, *illus. 4*).—In addition to dehydration and vitamin studies noted elsewhere in this issue, this report includes facts on the economics of farming, including income and expenses of dairy farmers, trends in Maryland agriculture, housing conditions and facilities for farm labor, agricultural production in wartime, and the machinery situation on Maryland farms; postwar tax problems, farm prices, and marketing farm products; agricultural engineering, including the curing and storing of sweetpotatoes; farm crops and soils, including drought tolerance of corn hybrids, variety tests of barley and rye, and fertilizer tests with rye, wheat, and hay, cover and green manure crops, and use of lime and phosphorus carriers; feeding and breeding livestock, including rations for steer calves and pregnant ewes, and corn silage v. clover and timothy hay for pregnant beef cows; potato and strawberry variety tests; cause of sweetpotato discoloration during dehydration; dairy cattle and dairy products, including the feeding value of cheat for dairy cows, dry starters, and vitamin A and carotene requirements for dairy calves, and effect of vitamin A on milk production; influence of bacteria on fruits and vegetables during dehydration and storage and on dressed poultry; animal diseases, including the control of infectious mastitis, rabies, and bovine trichomoniasis; control of Japanese beetles, European corn borer, and tobacco hornworm, use of concentrated sprays, and migratory beekeeping; fruits and vegetables, including peach and lima bean varieties and culture, and varieties of tomatoes and vegetable soybeans; and poultry, including use of dehydrated pea vines, effect of heating soybeans on nutritive value, effects of environment on hatchability, shipping hatching eggs by airplane, effect of chilling on manifestation of resistance to pullorum disease, role of wheat in pullet disease, relation of shank length to percentage of edible meat and of vent eminence in chicks to sexual maturity, feather pigment identification of leucosis, external morphology of the turkey embryo during development, and the effect of adrenal cortex hormone on egg production.

Annual Reports of the Ohio Agricultural Experiment Station, 1939-1943, E. SECREST ET AL. (Coop. U. S. D. A. et al.). (*Ohio Sta. Bul. 658 (1945), pp. [89]*).—In addition to meteorological data, these reports give administrative data as to projects, publications, and finances for each of the respective years.

What's new in farm science: Annual report of the director [Wisconsin Station, 1944], II, compiled by N. CLARK and N. HOVELAND. (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul. 466 (1945), pp. 63, illus. 17*).—In addition to a note on a new form of mosaic, this portion of the annual report (E. S. R., 93, p. 235) deals with studies with vegetables, including near-wilt resistant peas, DDT for control of pea aphid and cabbage insects, cabbage breeding, sabadilla as an insecticide, wilt-resistance in tomatoes, and variety tests of tomatoes, snap beans, and beets; potatoes, including use of antisprouting hormones, discoloration in near-freezing storage, precautions against spindle sprout, tests of the Sebago variety, certified v. ordinary stocks, plow-sole fertilization, fertilizer needs, and insecticidal value of DDT and sulfur; fruits, including DDT for apple maggot and codling moth control, apple variety tests, use of the spray boom in ground spraying, necrotic ring spot of cherry, and value of high Mg lime in leaf spot sprays; soil management, including fertilizer trials in various areas, fertilizers for alfalfa and canary grass, plow-sole fertilization for sugar beets, and soil and water losses in pasture renovation; hay and pasture, including sabadilla dusting of alfalfa, trials of Ladino clover, bromegrass, and pasture grasses and management; grain, including variety tests with wheat and corn, ammonium nitrate as a grain fertilizer, and corn borer control; livestock and poultry feeding, including effect of sunlight on mineral requirements of pigs, cow manure as a source of B vitamins for pigs, toxicity to swine of activated sludge, canary

grass silage corncocks for steers, fish byproducts in chick rations, and riboflavin in poultry breeding rations; and special subjects, including use of DDT and sabadilla, water-congestion and disease in tobacco, growth of digitalis in Wisconsin, and propagation of rust-resistant white pines.

MISCELLANEOUS

Motion pictures of the United States Department of Agriculture, 1945 (*U. S. Dept. Agr., Misc. Pub. 574 (1945), pp. 52, several illus.*).—A revision of an earlier descriptive list (*E. S. R.*, 86, p. 412).

Minnesota Farm and Home Science [October 15, 1945] (*Minn. Farm and Home Sci. [Minnesota Sta.], 3 (1945), No. 1, pp. 16, illus. 22*).—In addition to several articles noted elsewhere in this issue, this number contains *Molds in Your Air*, by C. M. Christensen (pp. 4-5); *What Can You Pay for a Dairy Barn*, by S. A. Engene (p. 9); *It's Time to Control Swine Brucellosis Now*, by H. C. H. Kernkamp, M. H. Roepke, and D. E. Jasper (pp. 10, 11); and *75 Percent of Minnesota Farm Products Find Markets Outside the State* (p. 15).

Mississippi Farm Research [September-October 1945] (*Miss. Farm Res. [Mississippi Sta.], 8 (1945), Nos. 9, pp. 8, illus. 9; 10, pp. 8, illus. 13*).—In addition to articles noted elsewhere in this issue and meteorological notes, these numbers contain the following:

No. 9.—Suwannee—*A New Home-Garden Strawberry*, by N. H. Loomis and G. M. Darrow (pp. 1, 8), and *Mechanical Production of Cotton*, by P. W. Gull and J. E. Adams (pp. 3-5) (both coop. U. S. D. A.), the first of which is also to be issued as Circular 123 and the latter in bulletin form; and *Controlling Cattle Grubs and Lice*, by C. Lyle (pp. 1, 8).

No. 10.—*Farm Product Prices Break Sharply*, by D. G. Miley (pp. 1, 7); *Phenothiazine Best Given to Sheep in Bolus Form*, by J. W. Ward (p. 2); *Time Expenditures in Homemaking*, by D. Dickins (pp. 3-6, 8), also to be issued in bulletin form; and *Rat Control on Farms*, by C. Lyle (p. 7).

Bimonthly Bulletin [September-October 1945] (*North Dakota Sta. Bimo. Bul., 8 (1945), No. 1, pp. 30, several illus.*).—In addition to articles noted elsewhere in this issue and miscellaneous abstracts and notes, this number contains *A Possible Use for North Dakota Straw [as Straw Board]*, by W. J. Promersberger (p. 14); *Land Market Activity in North Dakota, Second Quarter 1945*, by J. W. Porter and R. Engelking (pp. 15-17) (coop. U. S. D. A.); and *North Dakota Farm Prices*, by P. V. Hemphill (pp. 28-30).

NOTES

Alabama College and Station.—John F. Duggar, research professor in special investigations since 1921 and associated with the advancement of Alabama agriculture since 1896, died December 26, 1945, in his seventy-eighth year. A native of Alabama, he received the B. S. and M. S. degrees from the Mississippi College and had also studied at Southern University, George Washington University, Cornell University, and the University of Colorado. His early work was as assistant professor of agriculture in the Texas College from 1887 to 1889, editor of the *Southern Livestock Journal* in 1890, assistant director of the South Carolina Station from 1890 to 1892, and specialist in field crops in the U. S. Department of Agriculture as a staff member of *Experiment Station Record* from 1893 to 1895. In Alabama he served as professor of agriculture from 1896 to 1921, director of the station from 1903 to 1921, and director of the extension service from 1914 to 1920. In addition to his other services, he was well known for his three textbooks, *Agronomy for Southern Schools*, *Southern Field Crops*, and *Southern Forage Crops*.

Connecticut [New Haven] Station.—Benjamin H. Walden, associated with the station's entomological work from 1902 until his retirement on October 1, 1945, died January 6 at the age of 66 years. A native of Connecticut, he had worked on mosquito and gypsy moth control and many other projects. For the past 20 years he had been in charge of taxonomic work, the insect collections, and insect identifications. He was an authority on the Orthoptera and Hemiptera, and the author of the Orthoptera of Connecticut.

Walter O. Filley, associated with the forestry work of the station since 1909 and chief forester since 1912, retired on January 1.

Idaho University and Station.—Dr. C. W. Hodgson has been appointed associate professor and associate in animal nutrition.

Purdue University and Indiana Station.—Since November 1, 1945, the Indiana seed laboratory maintained as a Federal-State cooperative laboratory for the past 35 years has been functioning as a State agency in charge of A. S. Carter and L. C. Senberger. A new Federal laboratory has been established at Minneapolis, Minn., to which E. R. Clark, seed technologist for the U. S. Department of Agriculture, has been transferred as head. Regina B. Schulte, chief analyst since 1927, has been transferred to the Seed Laboratory of the Department at Beltsville, Md.

Dr. William S. Gillam, assistant professor of agricultural chemistry and assistant chemist, has resigned to engage in commercial work in Kansas City, Mo.

Maine University and Station.—A department of poultry research has been organized in the station. This will be headed by J. R. Smyth, who will also continue in charge of the university department of poultry husbandry.

Maryland University and Station.—Dr. E. W. Glazener has been appointed assistant professor of poultry husbandry and assistant veterinary husbandman for physiological research.

Cornell University.—Dr. L. A. Maynard, director of the U. S. D. A. Regional Plant, Soil, and Nutrition Laboratory, is to devote full time to the directorship of the School of Nutrition. He has been succeeded in his former position by Dr. Karl C. Hamner.

New York State Station.—Using technics similar to those employed during the war for drying large amounts of penicillin and blood plasma by subjecting the materials in a frozen state to high vacuum, the station has devised a method for

"freeze-drying" fruits and vegetables. The products to be dehydrated are placed in a container where they are subjected to a vacuum. The moisture vapor given off by the material is drawn into a drum submerged in a mixture of dry ice and acetone which has a temperature of -100° F. and condenses as solid ice on the inside of the drum. Although still in an experimental stage, the vacuum-dried foods are said to present a much more natural appearance when reconstituted for the table than in ordinary dehydration, and retain much of the original flavor and color and from 90 to 98 percent of the vitamin C.

North Carolina College and Station.—W. C. Warrick was added to the staff on November 1, 1945, as rural housing specialist. His duties will be concerned primarily with the design, planning, and construction of rural homes, with special emphasis on building materials suitable for home construction. J. Frank Doggett has been appointed extension soil conservationist and R. R. Bennett tobacco specialist. L. G. Willis, director of the soils laboratory at Wilmington and widely known for his studies on the role of minor elements in crop production, has been granted indefinite leave-of-absence on account of ill health.

Rhode Island College and Station.—Dr. Homer J. Wheeler, widely known as a pioneer research agricultural chemist and station director, died in Montclair, N. J., on November 18, 1945, in his eighty-fifth year. A native of Massachusetts and a graduate of the Massachusetts College in 1883, he served as assistant chemist in the Massachusetts Station until 1887. Two years followed at Göttingen University, which awarded him the Ph. D. degree in 1889. He then became chemist of the newly organized Rhode Island Station, serving in this capacity until 1907 and also becoming professor of geology in the college from 1891 to 1912, professor of agricultural chemistry from 1902 to 1910, acting president from 1902 to 1903, and director of the station from 1900 to 1912. His subsequent career was spent in commercial work, and included publication of three books—*Manures and Fertilizers*, 1913, *Citrus Culture in Florida*, 1923, and *Citrus Culture in California*, 1923.

An appreciative article written in 1929 by his long-time associate, Dr. E. W. Allen of the Office of Experiment Stations, summarizes his research contributions as follows: "He instituted a system of laboratory, pot, and field experiments which in connection with chemical studies resulted in outstanding contributions to the knowledge of soil fertility, notably the nature, cause, and cure of so-called acid soils, which he showed to be widespread in this country, and the effect of one crop on another in rotation. He studied intimately the action of various fertilizing materials, the nutritive requirements of plants and methods of determining these needs, sodium salts and their functions in soils and plants, the relations of lime and magnesia to plant growth, and the effect of the soil reaction on various crops and on the prevalence of such diseases as potato scab. In that connection he contributed to the differentiation of acid-tolerant crops from those unsuited to acid soils and showed the relation of soil treatment to acidity. He was the first to note the effect of sulfate of ammonia in increasing the acidity of soils deficient in lime."

Dr. Wheeler served as president of the Association of Official Agricultural Chemists in 1902 and of the American Society of Agronomy in 1911. He received the honorary D. Sc. degree from Brown University in 1911 and the Massachusetts College in 1933.

Virginia Polytechnic Institute and Station.—G. G. Dickenson has been appointed farm management specialist in the extension service. Other appointments include M. P. Conner as acting assistant agricultural economist and G. G. Richards as assistant plant pathologist. L. A. Hetrick, assistant entomologist, has resigned.

Washington College and Station.—Announcement has been made of the establishment at the college of the Washington State Institute of Technology and the Institute of Agricultural Science. The Institute of Technology includes the College

of Engineering, the School of Mines, the engineering and mining experiment stations, the State electrometallurgical laboratories, and the recently established division of industrial research and extension. Dr. Paul A. Anderson, chairman of the department of physics, has been designated acting director.

The integration of the services of the college of agricultural sciences includes the college of agriculture, the experiment stations, the extension service, the college of veterinary medicine, and in the college of home economics the research and extension activities pertaining to the agricultural sciences or supported by Federal and State agricultural experiment station and extension funds. Dr. J. C. Knott has been appointed director of the institute, with Dr. Mark T. Buchanan as vice director in charge of agricultural research and extension and director of the agricultural experiment station. Dean and Director E. C. Johnson will continue to serve as dean of the college of agriculture but has been relieved of administrative responsibilities as director of the station after 27 years' service. Superintendent J. W. Kalkus of the Western Washington Station continues as vice director of the station, and Dr. S. P. Swenson succeeds E. V. Ellington (appointed director of the extension service) as assistant director of the stations.

Dr. L. C. Wheeting, research professor of soils, and Cecil McClary, assistant poultryman, have returned from military service. Richard M. Bullock has been appointed assistant horticulturist with headquarters at the Tree Fruit Branch Station.

Wisconsin University and Station.—Announcement is made that the Wisconsin Alumni Research Foundation has dedicated to the public the Steenbock patents relating to the production of vitamin D by irradiation with ultraviolet light. All litigation in connection with the patents has been terminated.

Abstracts on Insect and Rodent Control.—The Coordination Center of the Insect Control Committee, National Research Council, is issuing at biweekly intervals a series to consist of about 12 abstract bulletins entitled Abstracts of Current Information on Insect and Rodent Control. These bulletins are not regarded as formal publications, but are issued prior to publication in regular channels as a means of relatively prompt dissemination of data accumulated by research agencies during the war and withheld for security reasons. It is stated that a part of the material thus far gathered represents a unique collection of the results of a variety of biological tests performed on a large series of chemical compounds. These data form the nucleus of a collection in which studies on the relation of chemical structure to biological function can be made and to which additional information can be added.

Venezuelan National Institute of Agriculture.—Construction is well under way for this institute, and it is expected to be completed in 1947. It is located at Maracay, in the center of the Venezuelan cattle region, and the plans include 30 buildings for residence and instruction.

Relocation of John Innes Institution.—The John Innes Horticultural Institution, established at Merton, England, in 1909 has acquired a new site at Bayfordbury in Hertfordshire, where a tract of 372 acres and a mansion erected in 1759 are available. It is expected to utilize about 150 acres for horticultural research within the next 10 years.

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RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY AND MICROTECHNIC

The chemical composition of grasses of northwest Texas as related to soils and to requirements for range cattle, J. F. FUDGE and G. S. FRAPS (*Texas Sta. Bul.* 669 (1945), pp. 56, illus. 1).—The chemical composition of 1,916 samples of the various grasses, arranged according to species, stage of maturity, and location, are presented. Protein and phosphoric acid decreased markedly with advancing maturity; crude fiber and nitrogen-free extract usually increased slightly; changes in lime were small and irregular. As the plants became older, there was a marked increase in the proportion of samples which were deficient in protein and phosphoric acid for range cattle. Protein was sufficiently high for range cattle in over 99 percent of the young grasses but was deficient in 73 percent of the mature grasses. Phosphoric acid was deficient in 34 percent of the samples of young grass and in 91 percent of those of mature grasses. Lime was not deficient in any samples, and was good in 63 percent and high in 29 percent of the samples. In general, protein, phosphoric acid, and nitrogen-free extract were higher, and lime and crude fiber were lower, in short grasses than in tall grasses.

There was no relation between total nitrogen in the soils of this area and the percentage of protein in the grasses. Soils which contained relatively high percentages of active phosphoric acid and lime produced grasses with a higher percentage of phosphoric acid and lime than grasses produced on soils which contained lower amounts of these constituents. This relation between composition of the soils and composition of the grasses was more pronounced in the young grasses than in grasses at the intermediate or mature stages of growth. Factors other than the composition of the soil affected the percentages of protein, phosphoric acid, and lime in the grasses, however.

The function of pyridoxine derivatives: Arginine and glutamic acid decarboxylases, W. W. UMBREIT and I. C. GUNSALUS. (Cornell Univ.). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 333-341).—The authors isolated the decarboxylases acting, respectively, upon arginine and upon glutamic acid from dried preparations of *Escherichia coli*, and showed that each requires a cocarboxylase to activate it.

¹ The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied on request.

This cocarboxylase was shown to be the same as the coenzyme required by the lysine and tyrosine decarboxylases. A synthetic codecarboxylase prepared from pyridoxal was shown to activate each enzyme.

"From the fact that codecarboxylase has been shown to function as the coenzyme of four amino acid decarboxylases, and synthetic codecarboxylase prepared from pyridoxal has been shown to function in three of these, it is suggested that one of the functions of the vitamin B₆ group is as the general coenzyme of amino acid decarboxylases."

Antipodal specificity in the inhibition of growth of *Lactobacillus arabinosus* by amino acids, M. FLING and S. W. FOX. (Iowa Expt. Sta. et al.). (*Jour. Biol. Chem.*, 160 (1945), No. 1, pp. 329-336, illus. 3).—The growth of *L. arabinosus* 17-5 (American Type Culture Collection, No. 8,014) in a complete bioassay medium was found to be inhibited by the addition of *d*-valine or of *d*-leucine. *d*-Alanine and the laevorotatory forms of alanine, valine, and leucine did not show appreciable inhibitory effects. Theoretical implications of these results are discussed.

Functional variants of diethylstilbestrol, M. RUBIN and H. WISHINSKY (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 11, pp. 1948-1950).—The authors describe the preparation of a number of compounds related to diethylstilbestrol in that one or more of the phenolic hydroxyl groups of the last-named compound were replaced by the amino group, bromine, the carboxyl group, or the methoxyl group.

The substituents which were varied in the series of compounds here dealt with being represented by R and R' in the general formula, $RC_6H_4C(C_6H_5)_2 = C(C_6H_5)_2C_6H_4R'$, the estrogenic activities, expressed as γ required to produce the effect of one rat unit were: R and R' both —OH, 0.3; R = methoxyl, R' = —OH, 2.5; R = methoxyl, R' = NH₂, 1,000; R = —OH, R' = NH₂, 7.5; R = —OCH₃, R' = —COOH, 1,000 inactive; R = —OCH₃, R' = Br, 1,000; R = —OH, R' = Br, 100; R and R' both H, 1,000 not active.

In tests of the bactericidal activity against a strain of *Staphylococcus*, the compound in which R and R' were —Br and —OH, respectively, was active in a concentration of 1:1,000,000 H and —OH, giving activity at 1:640,000, the amino and hydroxyl groups, 1:100,000 and H and H, 1:10,000.

16-Equilenone and 16,17-substituted equilenane derivatives, A. L. WILDS and L. W. BECK. (Univ. Wis.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 10, pp. 1688-1694).—A method used for the synthesis of $\Delta^{1,1'-2'}$ -keto-3,4-dihydro-1,2-cyclopentenophenanthrene was extended to the preparation of the related compound carrying an angular methyl group in the 2-position. By reduction this unsaturated ketone was converted into 16-equilenone. It was found that the unsaturated ketone could be used to prepare equilenane derivatives substituted in the 17-position. Some attempts to convert the 16,17-diketone by reduction into the desoxyequilenin analog of estriol are described. Methyl-1-phenanthrol and derivatives of this were synthesized.

Enzymatic oxidation of glutathione, S. R. AMES and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 549-562, illus. 4).—It was found that reduced glutathione could be oxidized by an enzymatic system involving cytochrome *c*, a substance which was found in cell-free preparations of mouse kidney homogenates. The effects of tissue concentration, cytochrome *c* concentration, and glutathione concentration on this system are reported. The glutathione oxidase system was strongly inhibited by heat, cyanide, diethyldithiocarbamate, and iodoacetate, was weakly inhibited by α,α' -dipyridyl and thioglycolate, and was not inhibited by azide and hydroxylamine. Glutathione was postulated to act as a coenzyme in certain systems involving the oxidation by molecular oxygen of fixed sulfhydryl groups occurring in tissue preparations.

Some amino acid analyses of hemoglobin and β -lactoglobulin, G. L. FOSTER (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 431-438).—Quantitative determinations of aspartic and glutamic acids, leucine, glycine, lysine, arginine, phenylalanine, and tyrosine were made by the isotope dilution method on acid hydrolysates of horse hemoglobin. β -Lactoglobulin was similarly examined for the first five of the amino acids mentioned. There was evidence to indicate that phenylalanine is slowly destroyed by boiling 6 N HCl but is not appreciably racemized. The results are compared with recent values in the literature.

Increased plasma fibrinogen induced by methylxanthines, J. B. FIELD, A. SVEINBJORNSSON, and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 525-528).—The oral administration of the methylxanthines, caffeine, theobromine, and theophylline, to dogs and rabbits raised the level of plasma fibrinogen. Xanthine, adenine, uric acid, guanidine, and glycocyamine increased the fibrinogen in the rabbit but not in the dog. The rabbit was markedly more susceptible to the fibrinogen-increasing capacity of methylxanthines than the dog. An increased fibrinogen level was found capable of persisting in the rabbit for from 2 to 3 weeks, the time depending on the dose.

Penitric acid, a new pigment from *Penicillium notatum*, F. H. STODOLA, J. L. WACHTEL, A. J. MOYER, and R. D. COGHILL. (U. S. D. A.). (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 67-70, illus. 1).—The authors isolated from culture liquors of *P. notatum* an optically active, yellow, crystalline carboxylic acid, melting with decomposition from 217° to 223° [C.] and having the composition $C_{14}H_{17}O_6N$. This compound, designated "penitric acid," showed the high specific rotation of -423° or -549° , the intensity of optical activity depending on the solvent. Electro-metric titration showed that penitric acid is approximately as strong as benzoic acid.

Decarboxylated by boiling in 2 N sulfuric acid, the new compound gave a yellow crystalline product of the formula $C_{14}H_{17}O_5N$, and m. p. 171°-172°. This substance was named " α -penitric." Decarboxylated in alkaline solution, penitric acid gave an isomeric compound called " β -penitric," yellow, crystalline, with m. p. 204°-205°. Both penitrics were found optically inactive. They appeared to be phenols.

The effect of pyridoxine deficiency on transamination in *Streptococcus lactis*, P. P. COHEN and H. C. LICHSTEIN. (Univ. Wis.). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 367-371, illus. 1).—The authors found that *S. lactis* cultivations from media of low and of high pyridoxine content differed markedly in their ability to decarboxylate tyrosine, but catalyzed the transamination reaction, $l(+)$ -glutamic acid + oxalacetic acid \rightarrow $l(-)$ -aspartic acid + α -ketoglutaric acid, at the same rate.

Allyl ethers of carbohydrates.—I, Preparation and polymerization of tetra-allyl α -methyl glucoside, P. L. NICHOLS, JR. and E. YANOVSKY. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 10, pp. 1625-1627, illus. 1).—The preparation and properties of tetra-allyl α -methyl glucoside are described. Polymerization of this compound in the presence of oxygen is discussed. In air or in oxygen, the ether named yielded, at high temperatures, clear, transparent polymers of the thermosetting type.

Carbohydrate characterization.—V, Anhydrazation of the aldopento-benzimidazoles, C. F. HUEBNER, R. LOHMAR, R. J. DIMLER, S. MOORE, and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 503-515, illus. 1).—The authors have shown that the compound formed from *o*-phenylenediamine and *d*-xyloic acid at 135° [C.] and described in paper 2 (E. S. R., 86, p. 435) of this series (E. S. R., 90, p. 578) as a product of incomplete condensation is, in fact, a product of completed ring-closure, the desired 2-(*d* xylo)benzimidazole; whereas the compound formerly supposed to be this benzimidazole and formed at 180° is a 1', 4'

anhydride of the same benzimidazole. Confusion concerning the structure of these two compounds arose from a difficulty in obtaining complete combustion of these benzimidazole derivatives in the Dumas nitrogen determination. A suitable form of the Kjeldahl method gave correct nitrogen values. The difficulty of the Dumas combustion was found characteristic of other of the authors' benzimidazole derivatives, especially those of the saccharic acid series. As further evidence of the structures now assigned, it was found that periodate and permanganate oxidation and ultraviolet absorption spectra of the product obtained by condensation of *d*-xylonic acid with *o*-phenylenediamine at 135° show it to be *d*-xylobenzimidazole. Permanganate oxidation yielded 2-benzimidazolecarboxylic acid, and periodate oxidation yielded 2-benzimidazolealdehyde, formaldehyde, and formic acid.

d-Xylo-, *d*-arabo-, *d*-lyso-, and *d*-ribo-benzimidazoles were transformed by heating at 180° in the presence of zinc chloride and hydrochloric acid to yield 2-1', 4'-anhydro-*d*-pento-tetrahydroxybutyl benzimidazoles. The structure of the anhydrides was indicated by their consumption of 4 moles of periodate to yield 2-benzimidazolecarboxylic acid, formaldehyde, and formic acid, and by their conversion to 2-(α -furyl)benzimidazole by heating with acetic anhydride. The oxidations of the anhydro-aldopento-benzimidazoles by periodate were interpreted as involving the oxidation of an α -hydrogen, activated by a carboxyl and an aldehyde group. This interpretation was substantiated by the behavior of bornyl-*d*-glucoronide which consumed 5 moles of periodate yielding bornyl formate and oxalic and formic acids.

Extraction of fatty substance from starch, R. L. WHISTLER and G. E. HILBERT. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 10, pp. 1721-1722, illus. 1).—A fraction of fatty material which was difficult to extract with methanol from intact granules of corn starch was found to be removed easily after a disintegration of the granules by various treatments, of which the most effective, from the viewpoint of the completeness of the subsequent extraction of the residual fat, consisted in the autoclave treatment of the starch paste for 2 hr., followed by passage through a supercentrifuge and Soxhlet extraction for 30 hr. The fat as determined by titration was thus reduced to 0.01 percent, the phosphorus to 0.00, and the nitrogen content to 0.03 percent.

It was concluded that all fatty material in starch appears to be bound by associative forces rather than by primary valence bonds.

Esterification of fatty and amino acids with 1,2-epoxides in aqueous solution, H. FRAENKEL-CONRAT and H. S. OLCOTT. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 8, pp. 1420-1421).—Fatty acids and amino acids were treated with ethylene oxide, 1,2-propylene oxide, and epichlorohydrin in aqueous solutions or suspensions at room temperatures. The methods used in the preparation of ethylene glycol monovalerate and propylene glycol-1-monobutyrate are described. Titrations and pH measurements demonstrated that amino acids or acylated amino acids were also readily esterified by epoxides. The interaction of propylene oxide with benzoyl-*d,l*-alanine, in the presence of one-tenth of the equivalent amount of sodium hydroxide, led to the disappearance of the undissolved material within 1 day. After 3 days the pH of the mixture had risen from 3.5 to 7. In alkaline solution or after the epoxide had reacted with all acid originally present, reaction of the epoxide with the amino groups was found to occur.

The lipids of the pig during embryonic development, W. A. GORTNER (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 135-143).—In a study of the lipid fractions of 438 fetuses, representing 66 litters and covering 70 percent of the gestation period of the pig, it was found that the water content of the pig fetus exhibited two rapid falls during growth, a phenomenon previously correlated with changes in the fetal kidneys. The total lipid and the lipid : protein ratio remained constant for a large part of the embryonic growth period. Evidence presented indicates that a considerable portion of the nonphospholipid fatty acids, often considered "neutral fat,"

is actually present in unesterified (free) form. On a dry-weight basis, the phospholipide content was at a maximum in the very young fetus, which had twice as much of this lipid as did the fetus at term. The phospholipide fatty acids, in common with the other acid fractions, had an average iodine number of 82. The unsaponifiable lipides in the dry solids progressively decreased in their percentage content during embryonic growth, the total and free cholesterol fractions roughly paralleling this fall. At no time was there any notable tendency for cholesterol to appear in ester form. The fetal glycerides gradually increased beginning about the middle of the gestation period, but even at term they accounted for only a minor part of the total lipid substance. Considerable differences between the development of the lipides in the fetal pig and that in the fetal rabbit were found.

The cascade impactor: An instrument for sampling coarse aerosols, K. R. MAY (*Jour. Sci. Instruments*, 22 (1945), No. 10, pp. 187-195, illus. 10).—The new instrument described and illustrated is said to sample wind-borne and stationary aerosols such as insecticidal mists, natural fogs and clouds, fine sprays, coarse dusts, pollen and spores, and the like. By means of four progressively finer jets impinging on glass slides in series the sample is split up into size-graded fractions in a form suitable for microscopic analysis. The greatest efficiency of the set-up is for particles 50μ - 1.5μ in diameter. The size grading greatly facilitates detailed microscopic examination of heterogeneous samples and in some cases enables approximate size distributions to be obtained by bulk estimations of the samples without need for microscopic sizing. Experimental results for the efficiency of jets in measuring particles are correlated by dimensional analysis, and a parameter of general applicability in estimating impaction efficiencies of jets is derived. Descriptions are given of new methods of dealing with volatile droplets and of analyzing the samples. There are 18 references.

A new method for the polarographic determination of nitrate, I. M. KOLTHOFF, W. E. HARRIS, and G. MATSUYAMA. (Univ. Minn.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 10, pp. 1782-1786, illus. 3).—In the presence of uranyl ions and in dilute hydrochloric acid solutions, nitrate was reduced at potentials where the second uranium wave occurred. The diffusion current of nitrate was well defined and was proportional to the nitrate concentration when the ratio of uranyl to nitrate was above a certain minimum. This ratio was found to depend upon the nitrate concentration. The reduction of nitrate under the above conditions involved five electrons, indicating a reduction to nitrogen. The high electron consumption allowed the quantitative determination of very dilute nitrate solutions. In a solution which was 0.01 M in hydrochloric acid and 0.1 M in potassium chloride, the half-wave potential was of the order of -0.9 to -1.0 v. (vs. saturated calomel electrode).

The proposed method had many advantages over the procedure in which the nitrate reduction wave was determined in the presence of a large excess of lanthanum chloride. The half wave potential of nitrate in the presence of much lanthanum varied between -1.3 and -1.5 v. (vs. S. C. E.), dependent on nitrate and lanthanum concentrations. The diffusion current was found proportional to the nitrate concentration over a very narrow range of nitrate concentrations only. It was found that the reduction involved six electrons. Small sulfate concentrations interfered in the lanthanum procedure, but not in the method based upon the uranyl ion.

Uranous salts could be used in place of those of uranyl in the catalytic polarographic reduction method for nitrate determination.

The micro-Kjeldahl determination of the nitrogen content of amino acids and proteins, L. MILLER and J. A. HOUGHTON (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 373-383).—With mercuric oxide as the catalyst, quantitative values for the nitrogen of lysine dihydrochloride were obtained, but not with cupric sulfate. Higher values were obtained for the nitrogen content of β -lactoglobulin with the use of

mercury as the catalyst. Under conditions standardized as here prescribed, quantitative values for the nitrogen content were obtained for alanine, arginine hydrochloride, cystine, glutamic acid, histidine hydrochloride monohydrate, isoleucine, leucine, lysine dihydrochloride, phenylalanine, tryptophan, tyrosine, valine, and glutathione. The nitrogen values obtained by this procedure for the proteins β -lactoglobulin, egg albumin, gliadin, the soybean globulins, and zein are compared with those reported in the literature.

The microbiological determination of amino acids, II, III (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 273-289, illus. 9; 291-294, illus. 1).—Methods similar to that reported upon in paper 1 of this series (*E. S. R.*, 91, p. 633) are described and illustrative results of determinations are stated.

II. Assay and utilization of glutamic acid and glutamine by *Lactobacillus arabinosus*, L. R. Hac, E. E. Snell, and R. J. Williams (pp. 273-289).—Turbidimetric and titrimetric procedures for the determination of *l*(+)-glutamic acid in protein hydrolysates are described. Turbidimetry usually gave values slightly higher than those of the titration form of the method. Turbidimetry was easier and less time-consuming than the titration and was preferred for samples neither too highly colored nor rendered turbid during incubation. The following values, corrected for moisture, were obtained with the proteins studied after 24 hours' hydrolysis: A purified casein 21.7 percent lactoglobulin 18.8 and 19.0 (different preparations); egg albumin 15.0; gliadin 45.5; gelatin 11.2; milk fibroin 2.2; edestin 21.3; horse hemoglobin 10.8; and horse carboxyhemoglobin 8.9 percent. Recovery experiments, agreement of values calculated at various assay levels and upon repeated assay, specificity studies, and agreement with other methods of analysis all indicated reliability of the proposed method. Occasional low values as compared with chemical analyses required further study for explanation. In some instances, both stimulatory and inhibitory substances were encountered in crude natural materials, and further study of their assay was indicated.

It was found that glutamine was more active than *l*(+)-glutamic acid. Activity of the latter was increased toward that of glutamine as a limit by increasing the size of the inoculum, lengthening the incubation period, lowering the initial pH of the medium, and adding ammonium salts to the medium. These data indicated that glutamic acid was converted to glutamine before utilization. This is held to be also true for *d*(-)-glutamic acid, α -keto-glutaric acid, and glutathione, which were less active than *l*(+)-glutamic acid but which permitted maximum growth at high concentrations. Pyrolidonecarboxylic acid and hydroxyglutaric acid were inactive.

III. Assay of aspartic acid with *Leuconostoc mesenteroides*, L. R. Hac and E. E. Snell (pp. 291-294).—*L. mesenteroides* P-60 was used successfully for the quantitative determination of *l*(+)-aspartic acid in protein hydrolysates. The following values were obtained with the pure proteins studied: A purified casein 7.2 percent; lactoglobulin 11.5; egg albumin 9.3; gliadin 3.3; horse hemoglobin 10.3; horse carboxyhemoglobin 10.8; gelatin 6.8; and milk fibroin 2.8 percent. Asparagine in high concentrations could substitute for aspartic acid. Aspartic acid appeared to be utilized directly as contrasted with its homolog glutamic acid, which is probably converted into the amide before assimilation.

Amino acid determinations on crystalline bovine and human serum albumin by the isotope dilution method, D. SHERMAN (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 439-443).—The isotope dilution method was employed to determine the amounts of glutamic acid, aspartic acid, tyrosine, and glycine yielded by crystalline bovine and human serum albumins, and of lysine yielded by bovine serum albumin. It was found that cystine dihydrochloride is much less soluble in 20-percent hydrochloric acid than glutamic acid hydrochloride, and in proteins containing appreciable amounts of cystine glutamic acid hydrochloride is very likely to be contaminated unless the

cystine is first removed. Conversion of serine to glycine did not occur under the conditions for acid hydrolysis of proteins.

The determination of serum protein concentration with a gradient tube, O. H. LOWRY and T. H. HUNTER (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 465-474, *illus.* 1).—A density gradient tube suitable for the rapid determination of the specific gravity of 2 to 3 mm.³ of serum is described, and directions for its use are given. The collection of a small amount of serum from the finger or ear for use in the gradient tube is described. Comparison is made between serum protein concentration in serum from the vein, finger, and ear; and the influence of storage on the results obtained is shown. In 240 individuals without liver damage, serum protein values obtained with the gradient tube are correlated with those calculated from total nitrogen determinations and for such a standard deviation of 0.24 gm. percent has been found between results by the two methods. The use of the gradient tube for measuring blood hemoglobin concentration is described.

Separation of α - and β -casein, R. C. WARNER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 10, pp. 1725-1731, *illus.* 5).—To reduce as much as possible alterations of the casein caused by isolation procedures, unpasteurized milk was collected at the time of milking, treated with toluene, immediately chilled to 2° C., and skimmed and precipitated at this temperature. Precipitation of the casein was effected by adding 0.1 N hydrochloric acid to bring the reaction to pH 4.6, ice water was added, and the precipitate was washed repeatedly by decantation. The casein was redissolved by adding sodium hydroxide sufficient to adjust the reaction to pH 6.5, and the solution was twice extracted with ether, diluted to a 0.5 percent protein concentration, and reprecipitated by addition of 0.01 N hydrochloric acid. The casein was then thoroughly washed with water, the low temperature having been maintained throughout these operations, and the wet precipitated casein was used for the fractionation experiments, a portion having been dried by alcohol and ether for other purposes.

From an acid solution, of pH 3.5, α -casein was precipitated at about pH 4.4 to 4.5 by the careful addition of sodium hydroxide solution, temperature and other precautions against alteration of the protein being maintained. On warming the filtrate from the α -casein to room temperature and adjusting this solution to pH 4.9, a precipitate containing α -casein and other protein substance of an electrophoretic mobility lower than that of β -casein, in addition to the β -casein, was obtained.

After removal of α -casein at pH 4.5 and at 2° the β -casein was precipitated from a solution of higher pH value by lowering the pH value to 4.9.

These two fractions were found to represent the two peaks of the electrophoretic pattern shown by casein at pH 7. The fractions were not electrophoretically homogeneous under all conditions, but had been purified to a degree such that neither fraction showed the presence of any of the other fraction. The electrophoretic behavior of casein and the occurrence of complex formation between α - and β -caseins are discussed.

A colorimetric method for the microdetermination of α -alanine in blood, B. ALEXANDER and A. M. SELIGMAN (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 9-19, *illus.* 2).—The authors based a method for the determination of this amino acid upon its deamination and decarboxylation by ninhydrin (triketohydrindene hydrate) and determination of the resulting acetaldehyde by measurement of the color produced by the reaction of the acetaldehyde with *p*-hydroxybiphenyl. A simple apparatus for aerating the aldehyde from the refluxing reaction mixture is described and illustrated. Of 24 amino acids tested for interference, 20 did not interfere at all. By controlling the reaction at pH 5.5 to 5.6, the proportion of any aspartic acid present which was determined as alanine was reduced to 4 percent. The effect of formaldehyde, formed quantitatively from glycine, could be avoided by prolonged

aeration of the refluxing reaction mixture to separate the aldehydes. By raising to 37° C. the temperature at which the aldehyde is reacted with *p*-hydroxybiphenyl in strong sulfuric acid solution, the effect of the aldehydes from leucine, norleucine, and norvaline was much reduced. Norvaline interfered at most to the extent that 6 parts were required to give the same color intensity as 1 part of alanine.

A new method for the oxidation of aneurin to thiochrome and a procedure for the determination of aneurin in oats, W. I. M. HOLMAN (*Biochem. Jour.*, 38 (1944), No. 5, pp. 388-394, illus. 1).—The method, described in detail, oxidizes thiamine to thiochrome by means of HgO dissolved in KCl solution. Pure thiamine solutions give accurate readings with this procedure, but extracts of oats require an additional adsorption step to remove interfering impurities.

The modifications found necessary to obtain satisfactory results include (1) enzyme digestion of the sample in a phthalate solution, (2) the use of 0.05 M phthalate solution acidified to pH 4.0 for dilution and extraction, (3) the consecutive adsorption (5 times) on small amounts of Decalco, and (4) elution from the Decalco with 25 percent KCl solution. An aliquot of the KCl eluate is treated with 1 percent HgCl₂ solution and 0.06 N-NaOH solution to provide the test sample. Another portion of the eluate is treated with NaOH and Na₂SO₃ solution and treated so as to destroy all thiamine present.

After neutralization of this eluate, three separate aliquots are taken to serve as standards, varying amounts of thiamine being added to each aliquot. The remaining procedure parallels that of the test solution. If all conditions are rigorously controlled, reproducible results agreeing within 2 percent can be obtained.

The colorimetric determination of arginine in protein hydrolysates and human urine, A. A. ALBANESE and J. E. FRANKSTON (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 185-194, illus. 4).—In the color reaction of arginine with α -naphthol and a hypohalite, followed by addition of urea to destroy excess of the last-named reagent, the authors found that hypobromite need not be substituted for the original hypochlorite to avoid fading of the color if the concentration be reduced from 0.3 N to 0.06 N. The color was more stable with the hypochlorite than with the hypobromite when the concentration was reduced to that specified. In this modified form, the reaction affords greater convenience of operation and accuracy of the determination of arginine in protein hydrolysates and human urine. The arginine values for protein hydrolysates obtained by this method are compared with those secured by other technics. The urinary analyses of 24-hr. specimens from 37 normal adult males indicate that 50 to 150 mg. of arginine are excreted daily. The possibility that a portion or all of this measurement may be due to the presence of methylguanidine is discussed.

On the colorimetric determination of creatinine by the Jaffe reaction, R. W. BOWSNES and H. H. TAUSSKY. (Cornell Univ.). (*Jour. Biol. Chem.*, 158 (1945), No. 3, pp. 581-591, illus. 4).—In a study of the effects of variation in the picric acid and alkali concentration in the determination of from 1 γ to 50 γ of creatinine in 5 cc. of solution, it was found that the amount of colored creatinine compound formed as measured by the color developed is independent of the concentration of the picric acid added above a low limiting concentration of picric acid. The amount of colored creatinine compound formed is greatest at low concentrations of alkali and progressively decreases as the concentration of alkali is increased. The rate at which the color develops is inversely proportional to the concentration of both the picric acid and the sodium hydroxide. The color formed is not directly proportional to the concentration of creatinine except at very low concentrations in the 5 cc. of solution employed. By diluting this solution the linearity seems to improve. This apparent improvement, however, is considered an artifact. A procedure based upon these observations and adapted for the determination of creatinine in blood filtrates is described.

A specific micromethod for the colorimetric determination of glycine in blood and urine. B. ALEXANDER, G. LANDWEHR, and A. M. SELIGMAN (*Jour. Biol. Chem.*, 160 (1945), No. 1, pp. 51-59, illus. 3).—The basis of the method for the determination of glycine, the technic of which is here detailed, is that of the deamination and decarboxylation of the amino acid by triketohydrindene hydrate (ninhydrin), distillation of the formaldehyde resulting from the ninhydrin reaction, and determination of the formaldehyde colorimetrically with 1,8-dihydroxy-3,6-disulphonic (chromotropic) acid. The color produced in this second reaction has its absorption maxima, in the visible spectrum, at 478 and at 562 m μ , the respective molecular extinction coefficients being 3946 and 4201. A light filter specified as "No. 565" gave the method its highest sensitivity. A calibration curve for a "No. 540" filter is also shown, however. The method was applied to 5.0-cc. samples of blood filtrates. By using the color-forming reaction only, it was possible to measure as little as 0.04 γ of formaldehyde per cubic centimeter (1 : 25,000,000).

The separation of purine nucleosides from free purines and the determination of the purines and ribose in these fractions. S. E. KERR and K. SERAIDARIAN (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 211-225).—The authors found that the free purines adenine, guanine, and hypoxanthine are quantitatively precipitated by silver nitrate in the presence of sodium trichloroacetate and H₂SO₄ (0.02 to 0.05 N), whereas in dilute solution the nucleosides adenosine, guanosine, and inosine remain unprecipitated. All of these purines and nucleosides are quantitatively precipitated by silver nitrate when the solution is made slightly alkaline with NaOH.

A method of analysis for the nucleosides and free purines in trichloroacetic acid extracts of tissues is described. After removal of nucleosides by precipitation with uranium acetate, the free purines are precipitated by AgNO₃ in acid solution (pH between 1.5 and 2.0), and the nucleosides by AgNO₃ in the presence of a slight excess of NaOH. The purines and nucleosides are extracted from the silver precipitates by HCl by methods previously determined.

A modification of Bial's reaction for pentose permits the determination of *d*-ribose in an ordinary colorimeter with a special light filter.

Analysis of data for A. A. C. C. check sample service.—I, Protein and thiamine results 1943-44, W. O. S. MEREDITH (*Cereal Chem.*, 22 (1945), No. 3, pp. 437-448).—Six samples of flour (of which one was in duplicate) were assayed for protein by 68 laboratories. The data obtained were analyzed statistically. "On the basis of a found standard error of a single sample of 0.15 percent protein, 82 percent of the laboratories agreed within \pm 0.12 percent of the general mean value of 12.52 percent protein for the six samples. This standard error was found to be abnormal and the normal standard error was calculated to be 0.09 per cent protein; 56 percent of the laboratories agreed within \pm 0.07 percent of the mean protein value." Analysis also was made of the variability within laboratories, 37 laboratories showed errors outside the range of random differences, and 18 laboratories showed abnormally high variability.

"The data for the thiamine determination, which represent results from 20 laboratories, were extremely variable. The original standard error of a single sample was 0.52 mg. thiamine per pound, and when adjusted for abnormality it is 0.30 mg. per pound. Recommendations are made regarding the handling of the data obtained from future studies."

A new reagent for the determination of sugars. M. SOMOGYI (*Jour. Biol. Chem.*, 160 (1945), No. 1, pp. 61-68, illus. 2).—In a study of the behavior of the Shaffer-Hartmann reagent (E. S. R., 45, p. 111), the author found that lowered alkalinity gave, in general, higher reduction values, so that smaller quantities of sugars could be determined. The diminished alkalinity also lowered the rate of the oxidation of the sugars, however, prolonging the required heating and causing difficulty with sugars (as maltose) which react more slowly than does glucose. A separate reagent

of high alkalinity had to be used for determining maltose and other slowly oxidized sugars. The potassium iodide of the Shaffer-Hartmann reagent, added to lessen the self-reduction of the reagent, was found to render soluble a small part of the cuprous copper, with the result of increasing the reoxidation and limiting the sensitivity of the reagent to low sugar concentrations.

A reagent in which the alkaline component consisted of equimolecular proportions of disodium and trisodium phosphate, in which sodium sulfate was used to prevent reoxidation of the cuprous oxide, overcame these difficulties. It was found alkaline enough for the determination of the slowly reacting sugars; it showed no self-reduction at room temperatures, even in sunlight; and reoxidation was not observed. The new reagent was found suitable both for idometric and for colorimetric technics, and it permitted the accurate determination of from 0.01 to 3.0 mg. of glucose or of from 0.03 to 6.0 mg. of maltose by either technic.

Determination of blood sugar, M. SOMOGYI (*Jour. Biol. Chem.*, 160 (1945), No. 1, pp. 69-73).—The author's technic for deproteinizing blood with zinc sulfate and sodium hydroxide, noted in the preceding abstract, was modified by substituting barium hydroxide for sodium hydroxide. Advantages of this change are pointed out. Methods for idometric and for colorimetric determination of blood sugar with the new reagent are given.

The use of decolorizing carbon to avoid error in the determination of dextrose in fruits by the Lothrop and Holmes method, R. V. LOTT. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 149-151).—Methods for the differentiation of reducing sugars as dextrose and levulose are said to be not as well established as those for sucrose. The author presents data obtained in the analysis of apple and peach fruits which suggest that decolorization of the sample solution by adding decolorizing carbon is highly desirable when the Lothrop and Holmes method for the determination of dextrose and levulose (E. S. R., 66, p. 609) is used.

In nondecolorized samples, there is a tendency toward erroneously high dextrose and low levulose percentages. Decolorization is described as a simple procedure that does not detract from the desirability of the Lothrop and Holmes method.

Spectrophotometric determination of small amounts of choline, R. J. WINZLER and E. R. MESERVE (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 395-397, illus. 2).—The sensitivity of the colorimetric determination of choline as the reineckate was found to be increased by the use of ultraviolet light instead of the visible spectrum. In acetone solution, choline reineckate showed a very strong absorption band sharply peaked at 327 mμ, the molecular extinction coefficient at this wavelength being 5.82×10^3 as against 0.12×10^3 for the maximum of the relatively weak and broad band centered at 525 mμ. The method showed an accuracy of ± 5 per cent in the examination of samples containing from 50γ to 400γ of choline hydrochloride.

It was found that if a sample contains more than about 1,000γ of choline, satisfactory readings can be made in an ordinary photocolormeter with a green filter [absorption characteristics not specified].

Sodium phenolphthalein phosphate as a substrate for phosphatase tests, C. HUGGINS and P. TALALAY (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 399-410, illus. 5).—The authors prepared a sodium phenolphthalein phosphate by treating phenolphthalein with phosphorus oxychloride and adding pyridine at a rate such that the reaction mixture could be prevented from becoming hot. The reagents were required to be dry. After completion of the reaction (overnight), the solvent was evaporated, water was added slowly and with stirring, and, after evolution of the hydrochloric acid formed in this reaction, the precipitated acid was dissolved in strong sodium hydroxide. The pyridine having been extracted with ether, the free diphosphoric acid was precipitated by acidification. The precipitate was dried, ground, and dissolved in methanol, with addition of pyridine to increase its solu-

bility; and the required sodium salt was precipitated by adding an ethanol of sodium ethoxide. The compound was easily soluble in water and contained no free phenolphthalein, but was impure, being contaminated with a small amount of inorganic phosphate. It was, however, serviceable as a substrate for phosphatase tests.

In phosphatase determinations with this substrate, color was directly measured without precipitation of proteins and with a few technical operations. The accuracy was within ± 2 percent in duplicates. In addition to its convenience and accuracy, the method was found to have the advantage that the kinetics of alkaline phosphatase activity can be studied directly and continuously without sampling.

An evaluation of micromethods for phospholipid, W. A. GORTNER (*Jour. Biol. Chem.*, 159 (1945), No. 1, pp. 97-100).—The phospholipide contents of 34 lipide extracts of animal tissues were determined from the lipide phosphorus contents, by oxidation of the fatty acids from the acetone-insoluble lipides, and by direct oxidation of the intact phospholipide. When a phospholipide : phosphorus ratio of 24 was used, and when a fatty acid recovery of 63 percent of the weight of the saponified phospholipide was assumed, three methods gave comparable results. Considerably better agreement among replicate samples was obtained by phosphorus analyses than by either of the two oxidative procedures studied.

The isolation of α -estradiol from the urine of stallions, L. LEVIN (*Jour. Biol. Chem.*, 158 (1945), No. 3, pp. 725-726).—The author investigated four specimens of stallion urine and found that a major proportion of the estrogenic activity appears in the weakly phenolic, nonketonic fraction of the urine extract and is apparently due to estradiol. In one fresh sample of pooled urine from several stallions, assaying about 150,000 rat units of estrogenic activity per liter, the weakly phenolic, nonketonic fraction accounted for more than 90 percent of the activity. A similar figure was obtained from the concentrate of another pooled sample of stallion urine. The estradiol content of two urine specimens, collected several months apart from a single stallion, accounted for 42 and 44 percent, respectively, of the total activity. One of these specimens assayed 57,000 rat units per liter; the other assayed only 4,400 rat units per liter. Estradiol was isolated as the di- α -naphthoate in good yield from the two more active preparations. The fresh, pooled urine specimen yielded chemically pure, crystalline estradiol-di- α -naphthoate in a quantity equivalent to 5 mg. of free estradiol per liter of urine.

The antimony trichloride method for the determination of vitamin A, C. H. BENHAM (*Canad. Jour. Res.*, 22 (1944), No. 2, Sect. B, pp. 21-31).—The literature (48 references) on various applications or modification of the method is revised and appraised, and a critical description is presented. Low values for vitamin A were found to be caused by (1) incomplete extraction from the alcoholic soap solution when using petroleum ether instead of ethyl ether, (2) incomplete separation of the layers during extraction and washing, and (3) incomplete filtration through anhydrous sodium sulfate. Losses as high as 25 percent may be obtained if care is not taken throughout the entire procedure. Proper handling of the method gives consistent and reproducible results. As conversion of the *E* value to International Units has been varied at different times and with different workers, an accurate statement of absolute values is impossible. The test is considered highly useful, however, for comparative work.

A liver storage test for the assessment of vitamin A, K. GUGGENHEIM and W. KOCH (*Biochem. Jour.*, 38 (1944), No. 3, pp. 256-260, illus. 1).—"Rats weighing 35-50 gm. were used. The food of the mothers consisted of sprouted wheat, barley, bran, the seasonal vegetables, and milk. Two weeks before their progeny were weaned no vegetables were included in their food, the amount of vitamin A thus being reduced. The livers of the young rats then contained only 3-10 International Units of vitamin A. This amount of vitamin A disappeared completely within 2-6

days, when the young rats were given a vitamin A-free diet consisting of 65 percent rice flour, 13 percent casein (ethanol extracted), 10 percent olive oil, 8 percent dried yeast, 4 percent salt mixture, and vitamin D 100 I. U. per kilogram of food (mixed with the oil). This treatment produced rats with no signs of avitaminosis, which were suitable for our experiments."

For 2 days known amounts of vitamin A were administered per os in 0.1 cc. olive oil. On the fourth day the rats were killed, and the vitamin A content of their livers was determined by the method of Carr and Price, using a block comparator. Statistical analyses were made of the results obtained when various levels of vitamin A were fed. A comparison of this method with a 3-weeks' curative growth test indicated that the accuracy of the two methods was similar, and that the advantage of this liver storage test lay in the shorter time of assay and the fewer animals needed.

Report of the 1944-45 committee on niacin (nicotinic acid) assay, H. K. STEELE (*Cereal Chem.*, 22 (1945), No. 5, pp. 448-454).—Attempts were made to provide a rapid reliable method for niacin determination in flour or bread. Combinations and modifications of previously developed colorimetric methods (E. S. R., 87, pp. 14, 622; 89, p. 11; 90, p. 10) were made and the resulting procedure tested in several laboratories. A detailed description of the method used is given. The determination is based upon the measurement of the color produced when nicotinic acid reacts with cyanogen bromide and Metol. Comparison of results obtained by this method with assays made by other chemical and microbiological methods showed relatively good agreement between the various chemical methods used, but in most cases results obtained by microbiological assay were higher and less variable. Recovery of an added known amount of nicotinic acid, 14.04 $\mu\text{g.}$ per gram, averaged 11.6 $\mu\text{g.}$ by the collaborative chemical method and 13.5 $\mu\text{g.}$ by the microbiological method. The author concludes that "results from 10 laboratories indicated that this method yielded reproducible results which were in good agreement with those obtained by other chemical producers in use in the same laboratories, but the agreement between different laboratories was not satisfactory."

Microbiological assay methods for nicotinic acid, H. P. SARETT, R. L. PEDERSON, and V. H. CHELDELIN. (Oreg. State Col.). (*Arch. Biochem.*, 7 (1945), No. 1, pp. 77-85, illus. 1).—Based on the original methods of Snell and Wright (E. S. R., 87, p. 12) as modified by Krehl et al. (E. S. R., 90, p. 727), the authors present in detail their procedure, which they consider to be both simpler and more specific for nicotinic acid. The fundamental difference is the elimination of the purines, tryptophan, and all of the vitamins except pantothenic acid from the present assay medium, and the substitution of extracts of yeast, liver, and peptone, all treated by Lloyd's reagent. The inclusion of nicotinic-acid-free extracts of natural materials is considered to increase the response of the test organism to the added vitamin.

A comparison of the three methods in the assay of dried pork muscle, skim milk powder, and whole wheat flour with and without added nicotinic acid shows relatively good agreement, particularly between the new method and that of Krehl et al.

The differences in nicotinic acid content of various dehydrated foods obtained by extraction with acid or by enzyme digestion are also tabulated.

The microbiological assay of nicotinic acid in cereals and other products, E. C. BARTON-WRIGHT (*Biochem. Jour.*, 38 (1944), No. 4, pp. 314-319, illus. 1).—The assay method of Snell and Wright (E. S. R., 87, p. 12), modified by Krehl, Strong, and Elvehjem (E. S. R., 90, p. 727), has been found to be "expeditious and accurate." The author considers his own further modification of the latter method to give the best results. Changes made include doubling the concentration of casein hydrolysate to 1 percent, return of biotin concentration to the original 0.4 $\mu\text{g./1,000 cc.}$ medium, addition of xanthine, and the use of xylose (0.1 percent). A detailed description of the preparation of the medium is given. A wide variety of materials—various

wheats, fractions of wheat grains, flour, and other cereals (including rye, oats, barley, and corn), yeast, dried meat, milk, beer, vinegar, coffee, cocoa, and tea—have been assayed, and results are tabulated.

The use of *Acetobacter suboxydans* for assay of the lactone moiety of pantothenic acid, H. P. SARETT and V. H. CHELDELIN. (Oreg. State Col). (*Jour. Biol. Chem.*, 159 (1945), No. 2, pp. 311–319, illus. 1).—The authors base a microbiological assay procedure for the lactone portion of the pantothenic acid molecule upon the growth response of *A. suboxydans*. Alkaline cleavage of the lactone to α , γ -dihydroxy- β , β -dimethylbutyric acid increased its growth-promoting effect severalfold and made it as effective as equimolecular amounts of pantothenic acid. Supplements which allowed measurement of 0.1 γ to 0.5 γ of lactone per flask were added to the medium. β -Alanine cannot replace pantothenic acid or the dehydroxy acid for growth but increased the response to the dehydroxy acid and was included in the medium. Taurine inhibited growth response to both the dihydroxy acid and the pantothenic acid. This inhibition could be overcome by excess β -alanine. For assay purposes, alkaline hydrolysis was used to convert lactone and pantothenic acid to the dehydroxy acid. Good agreement of total lactone values of samples assayed at different levels and complete recovery of added lactone or pantothenic acid were obtained for several foods, concentrates, and urines. Yeast concentrates were found to contain more lactone than could be accounted for by microbiological assays for pantothenic acid, but not enough lactone to account for the high values obtained by chick assay.

The stabilization and estimation of pyruvic acid in blood samples, C. LONG (*Biochem. Jour.*, 38 (1944), No. 5, pp. 447–452).—The technic evolved by Lu (E. S. R., 82, p. 587) was not considered sufficiently reliable when applied to blood samples kept several days before assay. In an attempt to overcome the difficulties involved in maintaining a constant level of blood pyruvate in vitro, a comprehensive series of tests has been made. Various anticoagulants were tested (oxalic acid, potassium oxalate, sodium citrate, and NaF) on samples stored for a few minutes to 21 days. Stabilization tests were tried with iodoacetate, combinations of citrate and NaF, and oxalate plus iodoacetate and NaF. The effect of hemolytic agents (thymol and saponin), and the detergent cetyltrimethylammonium bromide ("Cetavlon") was also studied.

Satisfactory results were finally obtained by using citric acid, buffered with NaOH at pH4.0, NaF, and Cetavlon. Under the experimental conditions used, the pyruvic acid level in blood samples remained stable for at least 3 weeks.

Report of the 1944–45 committee on riboflavin assay, A. ARNOLD (*Cereal Chem.*, 22 (1945), No. 5, pp. 455–461).—Previously reported collaborative studies (E. S. R., 90, p. 10; 91, p. 506; 92, p. 322) have been continued, using the recommended fluorometric procedure described in detail. The 27 participating laboratories submitted results obtained by the collaborative method, other fluorometric methods, or microbiological methods. A flour sample and an air-dried ground bread baked from that flour were tested. Assays were made on 1.5-gm. and 3.0-gm. samples extracted either by hot water or by autoclaving. "Of the 81 results by all procedures, 71 were within ± 20 percent of the calculated riboflavin content of the flour sample (1.56 μ g. per gm.). This was in accord with previous collaborative results which demonstrated agreement among collaborators on assays of flour samples. The results on the 1.5 and 3.0 gm. samples were not significantly different. Since a large sample is to be preferred on general grounds, the 3.0 gm. amount appears to be a reasonable compromise. Either autoclaving or hot water extraction may be used to extract the vitamin."

The adsorption of riboflavin on florisil, S. H. RUBIN and E. De RITTER (*Jour. Biol. Chem.*, 158 (1945), No. 3, pp. 639–645).—The authors results show that ribo-

flavin is adsorbed more efficiently by florasil from simple solutions than from extracts of high potency sources such as yeast and liver; that the use of florasil in the analysis of these natural materials may cause errors ranging up to 30 percent; and that the factors influencing the adsorption include the clarity, volume, and concentration of the extracts. Combined riboflavin, as the phosphate or monosuccinate, was readily adsorbed on florasil.

The use of formaldehyde and 2,6-dichlorophenolindophenol in the estimation of ascorbic acid and dehydroascorbic acid. J. W. H. LUGG (*Austral. Jour. Expt. Biol. and Med. Sci.*, 20 (1942), No. 4, pp. 273-285, illus. 5).—"The extraction of ascorbic and dehydroascorbic acids from biological materials is discussed, and methods are described for estimating these substances in the "metaphosphoric" acid extracts (the dehydroascorbic acid after reduction to ascorbic acid by H_2S treatment).

"The methods make use of the fact that the reducing substances which may be encountered in the extracts may be divided into three classes according to their behavior with formaldehyde. Substances of Class 1 (comprising sulfites, thio-sulfates, cysteine, H_2S , H_2S -treated pyruvic acid, etc.) readily 'condense' (i. e. form feebly reducing or nonreducing substances with formaldehyde) at pH 3.5 or pH 1.5. Substances of Class 2 (of which the only member so far encountered is ascorbic acid) condense readily enough at pH 3.5 but only very slowly at pH 1.5. Substances of Class 3 (comprising quinol, H_2S -treated 2-Me-1,4-naphthaquinone, thiourea, reductone, ferrous salts, etc.) do not condense appreciably at either pH 3.5 or pH 1.5. The condensations are carried out under carefully controlled conditions. The reducing capacities of the reaction mixtures are then measured under standard conditions, preferably by titration at pH 1.5 with a standard solution of 2,6-dichlorophenolindophenol in drops of definite size to a point at which the coloration due to a drop persists for a standard time down to a predetermined fraction of its initial intensity. From these 'drop-persistence' titrations the ascorbic acid and dehydroascorbic acid contents are easily calculated.

"The full method is believed to be extraordinarily specific, ascorbic acid being the only substance found yet in Class 2."

A critical examination of Lugg's method for the determination of 1-ascorbic acid. II, G. A. SNOW and S. S. ZILVA (*Biochem. Jour.*, 38 (1944), No. 5, pp. 458-467, illus. 6).—The authors note that certain indophenol-reducing substances (formed when solutions containing glucose are treated in the presence of alkali) react with $HCHO$ differently than does pure reductone. Erroneous results are thus obtained when Lugg's method (see above) is used, and the error cannot be eliminated by carrying out the reaction at pH 2.0 or pH 3.5. The action of acid on pectin produces a reducing compound, presumably reductic acid, which also interferes with ascorbic acid determinations. Certain amino acids (glycine, glutamic acid, alanine) and the compound methyleneaminoacetone nitrile accelerate the disappearance of ascorbic acid in the presence of $HCHO$ at pH 1.5. The influence of these, and possibly similar substances, on the accuracy of Lugg's method is pointed out. A modified procedure is presented which is considered to eliminate the sources of error under discussion. The method requires careful pH adjustment of a trichloroacetic acid-NaCl extract with sodium citrate or HCl and phosphate citrate buffer. Three 5 cc. portions are used: (1) Adjusted to pH 1.5 and titrated with indophenol, (2) adjusted to pH 1.5 treated with $HCHO$, then titrated, and (3) treated with $HCHO$ at pH 3.5 adjusted to pH 1.5, then titrated. "A further 20 cc. of the solution adjusted to pH 3.5 are treated by passing a current of H_2S removed by means of a stream of N_2 . Three 5 cc. portions of the reduced solutions are then treated as above."

A simplified method for the determination of iron in milk. W. R. RUEGAMER, L. MICHAUD, and C. A. ELVEHJEM. (Wis. Expt Sta.). (*Jour. Biol. Chem.*, 158 (1945), No. 3, pp. 573-576).—A procedure in which the proteins were precipitated by trichloroacetic acid and heat, the supernatant solution buffered and treated with thio-

glycolic acid to reduce the iron compounds to the ferrous state, and the ferrous iron determined by addition of $\alpha\alpha'$ -bipyridine and measurement of intensity of the resulting color, failed when applied to milk because it did not set free the more stable combined iron. The authors were able to eliminate this difficulty and to secure complete recovery of the iron content of the milk and recovery of added iron by a modification in which they added to 5 cc. of milk in a 15 cc. centrifuge tube, 5 drops of thioglycolic acid of a commercial grade, 2 cc. of trichloroacetic acid, and 1 cc. of concentrated hydrochloric acid, preparing also a blank with all reagents used. Reaction mixtures so prepared were stirred, heated in a water bath at 90° to 95° C. for 5 min., cooled, stirred to break up the precipitate, and centrifuged. The solution was decanted, washed with a specified solution of trichloroacetic acid and hydrochloric acid, and again heated and centrifuged. The combined supernatant solutions were neutralized with ammonia (*p*-nitrophenol indicator), made just acid to the indicator, treated with a specified buffer solution, and made up to 25 cc. Aliquots from this solution, treated with small further additions of trichloroacetic acid to insure reduction of all iron compounds, were treated further with the bipyridine reagent and the color measured in a photoelectric colorimeter. The size of the aliquots (5 to 10 cc.) was such that they contained from 1 γ to 3 γ of iron. These quantities of iron were satisfactorily determined. Iron values obtained by this procedure range from 0.490 to 0.570 mg. per kilogram of raw or market milk.

The micro-volumetric determination of iron, with particular reference to blood, W. N. M. RAMSAY (*Biochem. Jour.*, 38 (1944), No. 5, pp. 467-469, *illus.* 1).—The method relies upon microtitration with standard $\text{Ti}_2(\text{SO}_4)_3$ solution, and is applicable to as little as 10 μg . of iron in blood or other biological material. If the ratio of Cu : Fe becomes too great, as in certain tissues such as liver, an additional step is necessary. The iron is separated from copper by saturating the solution with NaCl in approximately 5 N H_2SO_4 and shaking with ether containing 5 to 20 percent formic acid. The iron passes into the ether layer where it can be separated and assayed after the ether has been evaporated off.

"The coefficient of variation, when the method is applied to 0.2-cc. portions of blood, is 0.45 percent."

Notes on technic: A device to aid paraffin embedding, F. B. ANDREWS. (*Ind. Expt. Sta.*). (*Stain Technol.*, 20 (1945), No. 4, p. 137, *illus.* 1).—The author notes that, although properly made paper embedding boats will often float until the embedding is safe from water damage, it is usually held until hardening has proceeded far enough to resist such damage. This delay can be avoided by using as the water container an ice-cube tray from an electric refrigerator and making the embedding boats with flaps which will rest on the edges of the cube separators. A device of this sort is said to double the speed of the embedding operation and to make the process an efficient one for a single operator. An initial water temperature of 10° C. was found to effect a rapid cooling of the paraffin with a minimum of shrinkage and prevention of crystallization.

A tissue basket for paraffin infiltration, F. N. ANDREWS. (*Ind. Expt. Sta.*). (*Stain Technol.*, 20 (1945), No. 4, pp. 119-120, *illus.* 4).—Baskets were made from galvanized window screen by rolling pieces about $2\frac{3}{4} \times 1\frac{1}{4}$ in. into cylinders about $\frac{5}{8}$ in. in diameter, a joint being made by inserting the wire ends through the mesh of the screen and folding them back. Five such cylinders were mounted upon a common base of the screen, about $3\frac{3}{4} \times 1\frac{1}{2}$ in.

Method for affixing celloidin sections, L. W. LEWIS (*Stain Technol.*, 20 (1945), No. 4, p. 138).—The preparation of an affixative containing 7 percent of gelatin, 50 percent by volume of glycerol, and 0.5 percent of phenol (designated Haupt's affixative) is described, together with a procedure by which celloidin sections may be attached more firmly to the slide by this preparation than by the usual egg albumin affixative.

The Venetian turpentine mounting medium, G. B. WILSON (*Stain Technol.*, 20 (1945), No. 4, pp. 133-135).—The author found the following modifications of the Venetian turpentine mounting medium, as used after aceto-carmine staining, to be an improvement; Venetian turpentine 25 cc.; phenol, 50 cc.; propionic acid, 35 cc.; acetic acid, 10 cc.; water, 10 cc. The author's technic consisted of: (1) Fixation in acetic acid and alcohol, with maceration in hydrochloric acid or in 45 percent acetic acid if necessary; (2) staining in a strong aceto-carmine; and (3) replacement of the stain with the Venetian turpentine mixture above specified.

It was found that this technic could be used either with root-tip or with pollen-mother cell smear preparations. It was applicable to a variety of species, especially *Tradescantia reflexa* (meiosis); *Trillium* species (meiosis and root-tips); rye-root-tips; wheat pollen-mother cells; and the salivary glands of a *Drosophila* species. Preparations made by this method showed good permanence. In some instances the mountant showed the useful property of removing the stain from the cytoplasm without apparent effect upon that of the chromosomes.

Frozen sections from Bouin-fixed material in histopathology, P. H. HARTZ (*Stain Technol.*, 20 (1945), No. 4, pp. 113-114).—The author calls attention to the poor results, following formalin fixation, shown by several important stains; the shrinkage of formalin-fixed tissue when material so prepared for frozen section work is subsequently embedded in paraffin; and a lack of sharp definition of some histological details often observed when sections of formalin-fixed material are mounted in a glycerin-gelatin medium. He finds that fixation in Bouin's reagent avoids all of these disadvantages of formalin fixation. Thin blocks of tissue are fixed in a few hours, and the consistency of the tissues is firmer and better suited for sectioning in the frozen condition than is that of tissues fixed in formalin. Even friable tissues could be cut "fairly well" after the Bouin fixation. It was found that paraffin embedding of Bouin-fixed material causes relatively little shrinking, and that many microscopic details, especially those of histopathological importance are preserved much better by Bouin's than by the formalin fixation. Also, Bouin-fixed material was found to give excellent results with nearly all staining methods after paraffin embedding.

The use of dimethoxytetraethyleneglycol and triethyl phosphate in histological technic, O. E. NELSEN (*Stain Technol.*, 20 (1945), No. 4, pp. 131-132).—Dimethoxytetraethyleneglycol, the dimethyl ether of tetraethylene glycol, has the organic solvent properties conferred by five ether linkages in the molecule, low volatility, a boiling point of about 276° C., but complete miscibility with water.

"In histological technic it has been used mainly to displace water or alcohol in tissues in any strength. Water may be removed after fixation by placing tissue directly into this fluid. The writer has used it also to displace such fixatives as Bouin's and its various modifications, and Fleming's fluid. However, it appears preferable to first wash in water. . . . The advantages of this fluid are as follows: (1) Tissues may be left in it for several days to several weeks without injury; (2) possibly due to the fact that its molecules are large, it displaces water in tissue gradually, hence distortion or shrinkage is slight and a tedious displacement series is not necessary; and (3) it is stable and possesses a low volatility." It was found that tissue may be transferred directly from this solvent into paraffin, but passage through benzene or chloroform appeared preferable. A schedule showing steps from fixation through dehydration with dimethoxytetraethyleneglycol and transfer through benzene or chloroform to paraffin is given.

Triethyl phosphate, having a boiling range of from 210° to 220° and complete miscibility with water, could be similarly used. It displaced water from tissues with little, if any, shrinkage or distortion, and tissues could be transferred to it directly from water. Smear preparations could be transferred, after fixing and staining, to

equal volumes of this solvent and water, thence into the pure solvent, to xylene, and into the mountant, the results being excellent. Triethyl phosphate was used after Feulgen staining without extracting this stain. Fast green or light green could be dissolved in it for counterstaining.

Prefixing with paradichlorobenzene to facilitate chromosome study, J. R. MEYER. (U. S. D. A.). (*Stain Technol.*, 20 (1945), No. 4, pp. 121-125, illus. 3).—The author obtained good separation and sharp definition of chromosomes for counting by treating the material for from 1 to 4 hr. before fixing with a saturated aqueous solution of *p*-dichlorobenzene, fixation in 65 percent acetic acid, in acetic acid and absolute alcohol, or in Carnoy's reagent (glacial acetic acid, absolute alcohol, and chloroform) during from 12 to 24 hr., hydrolysis in 10 percent hydrochloric acid at 60° C. for from 10 to 30 min., rinsing in water, and transfer to 45 percent acetic acid on the slide for smearing and staining with aceto-orcein. Such preparations could be made permanent by separating coverglass from slide to equal volumes of glacial acetic acid and absolute alcohol, transferring them to absolute alcohol, and mounting with a drop of euparal. The *p*-dichlorobenzene solution was prepared by adding from 5 to 10 gm. of the crystals to 500 cc. of distilled water in a stoppered bottle and keeping the mixture at 60° overnight. The solution was used at room temperature.

Sharp photomicrographs show a clear separation of the normally tangled chromosomes of *Parthenium argentatum* (guayule), and of those of *Crepis capillaris*. Other genera to species of which the method was applied successfully were: *Allium*, *Tradescantia*, *Pisum*, *Lycopersicon*, *Fragaria*, *Juglans*, *Taraxacum*, *Tulbaghia*, *Cooperia*, *Zephyranthes*, *Hymenocallis*, and *Habranthus*.

"The duration of prefixation should be long enough to give many well-spread divisions with rod-shaped chromosomes, but not so long that a majority of the divisions have either very short chromosomes or have double the somatic chromosome number. The optimum duration of prefixation will differ with the type of tissue . . . and must be determined by experiment."

The use of certain phthalate compounds in embryology, O. E. NELSEN (*Stain Technol.*, 20 (1945), No. 4, pp. 129-130).—Di(methoxyethyl) phthalate, $C_6H_4(COOC_2H_4OCH_3)_2$, is described as having a refractive index of 1.500 at 25° C., a molecular weight of 282, and a solubility in water of 0.838. It will displace 85 percent or 95 percent alcohol in tissues. Tissue may be left in it indefinitely. As an intermediate step between alcohol and benzene, chloroform, or xylene in ordinary paraffin technic, it is useful. It is a suitable medium for the whole preparation study of various vertebrate embryos, and is particularly serviceable in the study of stages of early chick development. The refractive index was found to be high enough to effect considerable clearing of whole chick embryos transferred to it from 95 percent alcohol or from dimethoxytetraethylene glycol. For subsequent paraffin embedding, the material was transferred through equal volumes of this phthalate and benzene into pure benzene (two changes), and thence into paraffin.

Dimethyl phthalate with a refractive index of 1.513 at 25° and a solubility in water of 0.45, diethyl phthalate with refractive index of 1.499 and water solubility of 0.09, and dibutyl phthalate with refractive index of 1.490 and water solubility of 0.03 were found applicable in much the same way as was the first-named ester.

A combination bleaching-clearing agent and its use in the processing of "Spalteholz" preparations, J. T. GAMBLE (*Stain Technol.*, 20 (1945), No. 4, pp. 127-128).—The author combined the bleaching with the preliminary clearing by the use of a reagent consisting of equal volumes of 3 percent hydrogen peroxide and either 1 percent or 0.5 percent potassium hydroxide, the more dilute alkali being used for the more delicate specimens. The bleaching-clearing process was carried on until the specimen was completely depigmented and the ribs, or the bones of the legs, were visible.

Substitutes for ethyl alcohol, H. J. CONN and M. A. DARROW. (N. Y. State Expt. Sta.). (*Stain Technol.*, 20 (1945), No. 4, pp. 115-117).—The authors found both a specified brand of anhydrous methanol and anhydrous 2B alcohol (a denatured ethanol) entirely satisfactory substitutes for 95 percent ethanol in making up the following stains: (1) Delafield's hematoxylin; (2) eosin Y, saturated alcoholic; (3) methylene blue, saturated alcoholic; (4) Loeffler's methylene blue; (5) gentian violet, saturated alcoholic; (6) carbol gentian violet; (7) Stirling's gentian violet; (8) basic fuchsin, saturated alcoholic; and (9) Ziehl Neelsen's carbol fuchsin. The isopropyl alcohol was often equally satisfactory, but in the first four of the staining solutions listed above the isopropyl alcohol gave results not quite as good as those obtained with the other two solvents.

"It is suggested by these results that any user of stains who finds it difficult to obtain pure grain alcohol need have no fear as to his results if he substitutes anhydrous methanol for it. Anhydrous 2B alcohol gives as good results, but is not so easy to obtain commercially."

AGRICULTURAL METEOROLOGY

Movement in meteorology, R. W. JAMES (*Quart. Jour. Roy. Met. Soc. [London]*, 71 (1945), No. 307-308, pp. 74-87, illus. 1).—It is shown that as far as pure advection is concerned, entities like density, density continuity (front), and humidity mixing ratio move with the wind at the level considered. Any disparity between actual and streamline movements must be put down to development. A pressure field at a given level is advected in a direction and with a speed given by the average wind at all levels above that level. Similarly, the difference in pressure between two fixed levels is advected by the average wind between those levels. Any disparity between actual movement and that determined by the average wind must be attributed to development. The advection of contours and thickness lines can be inferred from advection of isobars and pressure differences in the absence of development. Winds are normally available up to pressure levels of 60 mb. in the British radiosonde ascents; thus over 90 percent of the atmosphere can be utilized in computing average winds. It is believed that averages based on these data will be accurate enough to give a satisfactory measure of advection of tropospheric phenomena. The average wind may also be taken as a measure of frontal advection, in the sense that the frontal trough of pressure must be advected in the same way as other pressure fields when development is not important. A measure of upward motion might be obtained on some occasions from consideration of the conflicting advectations at different levels. The theory of the pressure field being advected by the average wind at all levels accounts adequately for the fact that systems with "solid" wind currents do not move. An explanation of "thermal steering" is given.

Contribution to the theory of pressure variations, S. PETERSEN (*Quart. Jour. Roy. Met. Soc. [London]*, 71 (1945), No. 307-308, pp. 56-73, illus. 1).—Two separate equations for the barometric tendency are derived from (1) the hydrostatic equation and (2) the equations of motion. The hydrostatic tendency equation relates the barometric tendency (or the height tendency) to the winds integrated through isobaric layers, and also to the patterns of contours and "thicknesses" of the layers. The separate contributions to the pressure variations rendered by the thermal wind, the cyclostrophic components, and the horizontal divergence are identified and discussed. Methods of identifying the layer—or layers—constituting the site of the processes and of assessing the magnitude of their contributions to the pressure variations are outlined. The reaction of the pressure distribution at sea level to the circulation aloft is discussed in some detail, particularly with regard to the travel and development of cyclones, anticyclones, etc. The dynamical tendency equation relates the

barometric tendency to the accelerations integrated through isobaric layers. A brief discussion of this equation in relation to typical circulations is given.

Orographic rainfall and its place in the hydrology of the globe, L. C. W. BONACINA (*Quart. Jour. Roy. Met. Soc. [London]*, 71 (1945), No. 307-308, pp. 41-55, illus. 1).—An address designed to bring into focus the general subject of orographic rainfall on the global scale.

Some factors in micro-climatology, D. BRUNT (*Quart. Jour. Roy. Met. Soc. [London]*, 71 (1945), No. 307-308, pp. 1-10).—Micro-climatology is taken here to mean the study of climatic conditions over distances amounting at most to a few miles and even over distances measured in yards. They may be due to differences of soil, soil cover, aspect, contour, or drainage, the incidence of land and sea breezes, or the heating and pollution of the air in towns. Here, the author has tried to "give a simple account of some of the most important factors in the production of these variations, leaving aside the differences between town and country and the effects of sea breezes."

SOILS—FERTILIZERS

Major soil areas of Missouri: Their general characteristics and agricultural use, H. H. KRUSEKOPF (*Missouri Sta. Cir.* 304 (1945), pp. 4, illus. 1).—The major soil areas considered in this circular include northwest rolling prairie, north central glacial area, northeast level prairies and river hills, southwest level prairies, western Ozark border, eastern Ozark border, Ozark region, and southeast lowland.

Effects of cultivation and cropping on the chemical composition of some western Canada Prairie soils, [I-III] (*Sci. Agr.*, 19 (1939), No. 5, pp. 258-270; 23 (1942), No. 4, pp. 229-232; 25 (1945), No. 11, pp. 718-737).—The effects of different systems of land use on the chemical composition of Prairie soils are reported.

In the first study, by A. C. Caldwell, F. A. Wyatt, and J. D. Newton, the effect of cultivation and various cropping systems on the chemical composition of Prairie soils was determined from a comparison of cultivated and virgin soils in different areas. Twenty-six out of 34 cultivated fields in widely scattered points in Alberta and Saskatchewan were found to have lost nitrogen in amounts varying from 96 to 7,128 lb. per acre to the depth analyzed. The surface 6 in. of cultivated Black, dark brown, Brown, and Gray soils had lost, on the average, 1,775, 1,145, 765, and 723 lb. per acre of nitrogen, respectively; organic matter losses averaged 45,903, 29,622, 22,550, and 29,998 lb., or 21, 26, 27, and 42 percent, respectively, of the original organic matter content. A general loss or gain of organic matter at depths below 12 in. in the various zones has not been established. A straight grain and fallow system has not maintained the organic matter content of the cultivated Prairie soils of western Canada. Cultivation has resulted in a narrower C : N ratio in the surface horizon of 27 out of 34 cultivated fields, and in the subsurface of 22 out of 33 fields.

In part 2, by A. L. Brown, F. A. Wyatt, and J. D. Newton, the results presented show a trend similar to that reported in the first paper, average losses of nitrogen per acre for the surface 6 in. in the cultivated Brown, dark Brown, Black, Black transition, Gray transition, and Gray soils amounting to 17, 18, 18, 22, 18, and 22 percent, respectively. The authors point out that in 30 yr. there has been lost one-fifth to one-third of the organic matter from the soils studied. This shows the need for cropping practices that will provide for replacing or maintaining the soil organic matter.

Paper 3 of this series, by J. D. Newton, F. A. Wyatt, and A. L. Brown, reports upon a comparison of cultivated and virgin soils. The cultivated soils studied were obtained from fields ranging from those recently broken to those with a long period of cultivation, the average period of cultivation being 22 yr.

About 1,000 composite or individual samples of soils from 85 locations in Alberta, Saskatchewan, and Manitoba were analyzed for total organic carbon and nitrogen. The average losses of organic matter, in pounds, to the depth of 12 in., from the different soil zones were as follows: Brown, 25,566; dark Brown, 32,289; Black, 62,935; Black transition, 92,115; Gray transition, 39,632; and Gray, 28,253. The average losses of nitrogen, in pounds, to the depth of 12 in., were as follows: Brown, 889; dark Brown, 1,208; Black, 2,658; Black transition, 3,662; Gray transition, 2,455; and Gray, 1,308. The Black and Black transition soils, originally high in organic matter, lost the most organic carbon and nitrogen, whereas the Brown and Gray soils, originally relatively low in organic matter, lost the least. The losses were quite variable, at some locations being as great as approximately 50 percent of the original organic carbon and 40 percent of the nitrogen, whereas in other cases there was no apparent loss. It was calculated that, on the average, one-third to one-half, approximately, of the nitrogen lost from the surface 6 in. of cultivated soil in the Brown, dark Brown, Black, and Gray soil zones was absorbed by the crops grown on the soils.

Rotations which included legumes and grasses and the addition of barnyard manure, as carried on for 25 to 30 yr. at the Lethbridge, Lacombe, and Indian Head Dominion experimental stations, reduced or prevented losses of organic matter and nitrogen, as compared to the large losses which resulted from the equally old grain and fallow rotations at the same stations. The average annual loss of organic carbon from the older cultivated fields (cultivated on the average for 28.5 yr.), was approximately one-half that of the newer cultivated fields (cultivated on the average for 9.2 yr.), and the average annual loss of nitrogen from the older cultivated fields was less than two-thirds that of the newer fields.

General soil conditions in Central America, R. L. PENDLETON. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 403-407).—The author first briefly discusses the climate of the area here considered, then, under the general head of important geological and physiographical regions and their soils, takes up nonrecent volcanics and associated rocks, limestone residuals, old alluvial plains, recent alluvial soils, and recent volcanic activity and soils from volcanic products. Under a third main caption of some interrelations between volcanoes and soils, the author discusses the area under consideration by individual countries.

The leached red soils of northern Venezuela, W. L. POWERS and L. M. DE ELEIZALDE (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 396-402, illus. 9).—Leached red tropical soils of northern Venezuela carry large amounts of quartz and limonite. A low silica content has not developed, and a resistant fine quartz gravel has apparently aided infiltration and laterization. Iron crusts may form in the B horizon or elsewhere, depending on the prevalence of moisture and warmth, the prevailing direction and amount of movement of water, and place of evaporation. Concretions were largest in the A and most abundant in the B horizon of the Palenque soil (a laterite). Preliminary determinations indicated the base exchange capacity of the Guataparo (red mesa clay) profile samples is very low.

Soil erosion and land use in South Africa, H. H. BENNETT (*Pretoria: Dept. Agr. and Forestry*, 1945, pp. 28+, illus. 17).—A general survey of erosion conditions in South Africa, with suggested recommendations for methods that would reduce the damage from erosion.

An accounting of the daily accretion, depletion, and storage of soil-water as determined by weighing monolith lysimeters, L. L. HARROLD and F. R. DREIBELBIS. (U. S. D. A.). (*Amer. Geophys. Union Trans.*, 26 (1945), No. 2, pp. 283-297, illus. 5).—Daily values of accretion, depletion, and storage of soil-water under grass cover are presented for a 2-yr. period from data obtained by weighing monolith lysimeters located at the U. S. D. A. Soil Conservation Service research station, Coshocton, Ohio. Data from two soil types are given for a 1-yr. period.

Precipitation, the major accretion factor, as measured on the ground surface by the weighing lysimeters is greater than that measured in the recording rain gage. The quantity of water added to the lysimeters by the condensation, mostly in the form of dew, is significant. This quantity is seldom, if ever, measured in rain gages. The largest amounts of condensation absorption occurred in the period from September to May. Amounts of runoff for both years are small, due to the good vegetal cover on the soil surface. These lysimeters furnish reliable data on quantities of percolation at an 8-ft. depth for the types of soil profiles represented. Although the rainfall for both 1943 and 1944 was below normal, there was considerable percolation. This can be attributed to the presence of a grass cover protecting the soil surface from the beating and puddling action of raindrops, thus keeping the soil open to take up rainfall at rather high rates and thereby reducing the quantity of surface runoff. On a less protected soil surface, as cornland, much more water runs off the surface and the percolation is less.

The type of lysimeter used is described in detail. An extensive discussion by B. T. Shaw and C. W. Thornthwaite (pp. 292-297) is given.

The value of bacteriophage in classifying certain soil bacteria, H. J. CONN, E. J. BOTCHER and C. RANDALL. (N. Y. State Expt. Sta.). (*Jour. Bact.*, 49 (1945), No. 4, pp. 359-373).—Bacteriophage filtrates from each of six strains of *Agrobacterium radiobacter* were found usually able to lyse completely all of the six strains. The seventh strain, apparently yielding a bacteriophage of lesser potency, gave a filtrate which produced variable results. These phage preparations practically never lysed cultures of any *Rhizobium* species or of the miscellaneous soil organisms studied; the instances of such cross lysis were so few that it was easy to explain them as probably due to contamination with some bacteriophage other than the type that had been sought. Of 14 cultures showing the type of morphology typical of *Bacterium globiforme*, 6 showed almost perfect cross lysis with one another; the other 8 cultures showed little cross lysis, several of them apparently developing their own specific type of bacteriophage. From these and other similar observations it is, therefore, concluded that the bacteriophage method for classifying closely related types of bacteria has its value. Although, used alone, the method probably cannot separate one species from another, it is valuable as a supplementary test in cases of doubtful specificity.

On the salt resistance of *Azotobacter*, A. R. WERNER (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 47 (1945), No. 4, pp. 301-303).—The activity of *Azotobacter* was determined from soil samples obtained from the Ubinsk Meliorative Experiment Station representing soils of southern and western Siberia. Comparing the data concerning *Azotobacter* with those on the salt regime of the soils, it was found that the unsalinized Chernozem-Meadow soil and the slightly selinized medium-columnar Solonetz (alkali soil) do not contain or are very poor in *Azotobacter*, while all the other soil varieties of both the alkali and the saline series are rich in it.

Considering the degree of salinity necessary for *Azotobacter*, which reaches concentrations as high as 0.5-1.0 percent, one should class it among halophyte organisms and regard the action of salts on it as that of stimulants. This stimulating effect of salts was related to transformations of hormonelike substances within the cells and with the need of *Azotobacter* in growth substances.

AGRICULTURAL BOTANY

Microbes of merit, O. RAHN (*Lancaster, Pa.: Jaques Cattel Press, 1945, pp. 277+*, illus. 102).—Among "the very large bacterial population of the world, some species exist which are harmful to man. These disease bacteria are relatively rare. Though they represent only a very small fraction of the bacterial population of the earth, they have received much more attention than the good ones. . . . But after

all, the many good bacteria deserve some consideration too, and the need for an enthusiastic picture of the other side was felt. This book tries to give that picture."

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, 50 (1945), No. 2, pp. 235-238).—Abstracts of the following papers are included: Tyrothricin Production on Asparagus Juice Medium, by J. C. Lewis (U. S. D. A.), The Influence of Inorganic Salts on Penicillin Production, by R. Pratt, and Electron Microscopic Observations on Certain Bacteria and Bacteriophages, by E. W. Schultz and P. R. Thomassen (all p. 236); Variations and Mutations Among Actinomycetes, With Special Reference to *Actinomyces Griseus*, by A. Schatz and S. A. Waksman (pp. 236-237) (N. J. Expt. Stas.); Pyrimidine Analogs in Bacterial Nutrition, by F. B. Strandkov and O. Wyss (p. 237); and Utilization of Hydrogen by Sulfate-Reducing Bacteria and Its Significance in Anaerobic Corrosion, by K. M. Wight and R. L. Starkey (p. 238) (N. J. Stas.).

Photometre différentiel pour l'enregistrement automatique des courbes de multiplication bactérienne [Differential photometry for automatic recording of bacterial multiplication curves], P. BONÉT-MAURY and R.-J. WALÉN (*Ann. Inst. Pasteur*, 71 (1945), No. 7-8, pp. 284-291, illus. 4).—The apparatus described and illustrated is said to be more particularly adapted to studies of microbial growth and the effects of bacteriostatic action (ionized radiations, sulfamides, penicillin, etc.), but also to lend itself equally well to the registering of all phenomena manifested through variations in the rate of change in color or turbidity.

The continuous cultivation of micro-organisms, W. A. MOOR (*Science*, 102 (1945), No. 2658, pp. 594-595, illus. 2).—In the technic described and illustrated the test micro-organisms (*Penicillium notatum* and brewers' yeast) were so handled that the substrate could be continuously collected, spent organisms removed, and fresh substrate added. All glassware was chemically clean and sterile at the start, and all manipulations were so done as to prevent the entrance of outside organisms. The prime requisite of the set-up is the regulation of the flow and removal of the mat at such a rate that self-inoculation occurs with the minimum lag, and that adult organisms are removed before they mutate. It is believed that with proper modifications of the basic apparatus the method could be used to cultivate any micro-organism, and that it would prevent large losses of substrate by preventing the formation of mutants and by the possibility of stopping the reaction at any point if contamination should occur, with loss only of the preceding material.

α -Hydroxyisobutyric acid buffers (pH 2.3-5.0) not altered in pH by mold growth, W. C. TOBIE and G. B. AYRES (*Jour. Bact.*, 50 (1945), No. 3, pp. 333-335).—The authors describe a series of buffers—0.2 M with respect to the α -hydroxyisobutyric ion—covering the pH range of 2.3-5, prepared from NaOH and α -hydroxybutyric acid ("hib acid"). These are said to have the advantage that the acid radical is chemically and physiologically indifferent to most micro-organisms, thus adapting the buffers to use in cases where the constituents of previously described buffers are objectionable. Since they do not support mold growth to any appreciable extent, the pH remains unaltered over periods as long as 4 yr. without preservative.

Comparative studies of some peritrichous phytopathogenic bacteria, E. L. WALDEE. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 4, pp. 435-484, illus. 4).—"Classification of the bacterial plant pathogens, more than three decades a topic of lively debate, has undergone drastic changes in recent years. . . . In the process of revising . . . , unfortunately, considerable confusion arose; many commonly used generic names carried more than one connotation, depending upon which system was followed. Despite the efforts of E. F. Smith (1905) and Buchanan (1916-18) to place bacterial nomenclature on a more sound basis, progress in clearing up the confusion has been, for the most part, disappoint-

ing. . . . The present study was initiated in 1937 to investigate the relationships of the peritrichous plant pathogens to other bacteria with the thought that perhaps a more reliable basis for their classification and nomenclature might be devised."

Cross inoculation, morphological, cultural, and biochemical studies were made with 78 cultures of peritrichous and nonmotile plant pathogens together with a few bacteria not pathogenic to plants, with a view to determining their relationships; the results are presented in great detail. In morphology and staining reactions the plant-pathogenic bacteria were practically indistinguishable from the nonpathogenic species. A number of nonpathogenic cultures received as species of soft-rot bacteria were identified as species of the coliform group; in fact, the pectinolytic bacteria resembled the coliform organisms in many of their biochemical reactions but differed in that they produced marked protopectinase and gelatinase activity and fermented carbon sources anaerobically and microaerobically. The cornstalk rot bacteria resembled the coliform organisms in all respects except their lactose fermentation which was characteristically slow and weak.

As a result of the investigation the peritrichous and nonmotile plant pathogenic bacteria were found to consist of four groups considered of generic rank. A new family—*Erwiniaceae*—is proposed to include the emended genus *Erwinia* and related genera; *Erwinia* is conceived as a unit consisting of *E. amylovora*, *E. tracheiphila*, and *E. salicis*. The new genus *Pectobacterium* is offered to receive the pectolytic bacteria as a separate unit in the family *Enterobacteriaceae*, with the coliform bacteria; the genus thus composed includes *P. carotovorum*, *P. phytophthorum*, *P. aroideae*, *P. melonis*, and *P. delphinii* n. sp. The cornstalk rot bacterium is transferred to *Aerobacter* as *A. dissolvens*. The chromogenic peritrichous plant pathogens differed in a number of respects from the other bacteria studied; they at present occupy a doubtful position taxonomically but are believed close to *Serratia marcescens*. There are nearly eight pages of references.

Control of bacteria and fungi in paper mills, L. J. RAMPPEL (*Paper Trade Jour.*, 121 (1945), No. 22, pp. 27–29).—A general summary is presented (11 references) of theories concerned with the formation of slime. Of the agents used in its control, chlorine, chlorine plus ammonia, chlorine plus chloramine, copper sulfate, chlorophenates, and various mercurials are mentioned. Advantages are claimed for a new mercurial sold under various trade names, "the most prominent being Perm-Aseptic, Ramplex, Fen Antimildew, Fenaseptic, etc."

Precipitation of ferric hydrate by iron bacteria, R. L. STARKEY. (N. J. Expt. Stas.). (*Science*, 102 (1945), No. 2656, pp. 532–533).—This is a review (14 references) and theoretical discussion. "Although not all cases of iron precipitation from water are due to iron bacteria, an abundant precipitation of ferric hydrate can be expected whenever the iron bacteria are growing by the oxidation of inorganic ferrous compounds. . . . Until more specific information is obtained it seems certain that there will be confusion regarding the identity of iron bacteria, the reactions with which they are concerned, and their importance in the precipitation of ferric hydrate in nature."

Carbon dioxide utilization in the synthesis of acetic and butyric acids by *Butyribacterium rettgeri*, H. A. BARKER, M. D. KAMEN, and V. HAAS (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 31 (1945), No. 11, pp. 355–360).—*B. rettgeri* is said to be the first nonsporulating bacterium and the fourth anerobe shown to cause a total synthesis of acetic acid from CO₂. The detailed experimental results are presented.

The staining of bacteriophage, A. W. HOFER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, pp. 9, 13).—A fluorescent dye was found to reveal the phage particles under the ordinary microscope as tiny bright spots in an otherwise dark field. Further experiments with a different staining procedure and visible light rendered possible the detection of bright red phage

particles among and attached to the blue-stained bacteria. More recently a new phase-difference microscope has made it possible to see active phage particles and to watch them destroy living bacterial cells. The value of the new technics to research are briefly noted.

The burst size distribution in the growth of bacterial viruses (bacteriophages). M. DELBRÜCK (*Jour. Bact.*, 50 (1945), No. 2, pp. 131-135, *illus.* 2).—By the technic described, the burst size distribution for growth of virus α on strain "B" of *Escherichia coli* is determined for single infection; the burst sizes range from below 20 to over 1,000, with a broad maximum around 180. Comparison with the distribution of bacterial sizes in the same culture shows that the wide distribution of burst sizes cannot be accounted for by variations in bacterial size alone. Multiple infection with virus α gave the same distribution of burst sizes as single infection. Single and multiple infections with virus δ growing on the same host gave similar distributions, though with higher average burst sizes.

Interference between bacterial viruses.—III, The mutual exclusion effect and the depressor effect. M. DELBRÜCK (*Jour. Bact.*, 50 (1945), No. 2, pp. 151-170, *illus.* 4).—In this study (E. S. R., 88, p. 769), bacteria simultaneously infected with viruses α and δ were lysed after 13 to 17 min.—the same interval as for either virus alone. Bacteria with the mixed infection always liberated one or the other virus alone; this is called the "mutual exclusion effect." For equal multiplicity of infection with both viruses, about a third of the bacteria liberated virus α ; two-thirds, virus δ . A group of viruses attacking a single host can be arranged in a series according to their exclusion power. In mixed infections with these two viruses the average virus yield from a bacterium was very much less than in unmixd infections. The excluded virus depressed the yield of the successful one. This depressor action diminished gradually with increase in the time between addition of the two viruses; there was a critical time interval, however, beyond which no depressor action occurred, its length depending on the nature of the first virus but being independent of the nature of the virus acting as depressor. A high concentration of antibacterial serum added before the second virus prevented its adsorption; low concentrations failed to prevent adsorption of the second virus but diminished its interfering action. Added after adsorption of a virus, an antiviral serum diminished its depressor action. The "penetration hypothesis" here elaborated assumes (1) that the penetration of the first virus into the cell renders the cell membrane impermeable to any other virus, (2) that each virus has a characteristic penetration time and that the change in permeability occurs at the end of this time interval uniformly for the entire cell membrane, (3) and that dividing cells act as a unit up to the moment of separation. The depressor effect is interpreted as competition for a common substrate between the virus which penetrated the cell and the one which was excluded.

Effects of specific antisera on the growth of bacterial viruses (bacteriophages). M. DELBRÜCK (*Jour. Bact.*, 50 (1945), No. 2, pp. 137-150, *illus.* 1).—Exposure of virus-infected bacteria to strong antiviral serum failed to affect the course of virus growth. Survivors of a suspension of γ virus, over 99 percent of which was inactivated, were adsorbed as rapidly as the untreated γ particles; there was also no perceptible difference between the growth rates of these two groups. The γ virus inactivated by antiserum failed to interfere with the growth of untreated γ or α viruses. Adsorption of virus was strongly inhibited when the bacteria were pre-treated for a few minutes with antibacterial serum; this effect can be utilized for rapid titrations of such serums. Bacteria treated with high dilutions of antibacterial serum will absorb virus, but there is a slight delay in the liberation of virus from these bacteria.

The effect of antibiotic substances upon bacteriophage. D. JONES. (N. J. Expt. Stas.). (*Jour. Bact.*, 50 (1945), No. 3, pp. 341-348).—Streptothricin, streptomycin,

and clavacin were found to cause inactivation of various phages in bacteria-free filtrates; penicillin and actinomycin were without effect. No correlation was observed between the susceptibility of the host cells and that of the phage to an antibiotic agent. The action of different concentrations of antibiotics against *Escherichia coli* hosts and phage was also tested. When the concentration of the antibiotic was great enough to inactivate all the viable cells, the phage added to such mixtures was progressively decreased in 24 hr. With lower concentrations of the antibiotic, the phage multiplied only when the cells were also increasing. Phage in suspensions of streptomycin-treated cells was not reactivated by dilution after prolonged incubation. Tests with penicillin and streptomycin on *Staphylococcus aureus* phage and its host, at concentrations of the antibiotics which had no destructive effect on the phage alone, indicated that no reduction of the phage occurred when it was placed in the presence of the penicillin-treated cells; a definite decrease took place when streptomycin was used. In both cases, multiplication of the phage later paralleled an increase of host cells.

Method of testing sensitivity of microorganisms to penicillin, J. R. COPELAND ([U. S.] *Off. Surg. Gen., U. S. Army Med. Dept. Bul.*, 4 (1945), No. 5, pp. 596-599, illus. 3).—Penicillin-impregnated filter paper was used to demonstrate the relative sensitivity of a micro-organism to this antibiotic; in the tests reported it was best shown on a thin blood or agar plate. For assay, a standard known strain and the unknown are inoculated on the same plant. The impregnated paper lost little of its activity when stored at 4° C. for 60 days.

Penicillin assay and its control chart analysis, L. F. KNUDSON and W. A. RANDALL (*Jour. Bact.*, 50 (1945), No. 2, pp. 187-200, illus. 5).—A statistical technic is presented for graphically assaying by the cup plate method the potency of an unknown and the error of the assay by using four figures (V , W , R_+ , and R_-), calculated from the responses (diameters of zones of inhibition) to a high and a low dose of the unknown designated as u_H and u_L and a high and low dose of the standard s_H and s_L . The charts are adaptable to any number of plates and any dosage ratio, and the method is also adaptable to other assays of similar design. The control chart technic is suited to the method described for insuring uniform assays at any one laboratory. A graphic comparison is made of the differences among laboratories on assays of the same lot of penicillin.

Influence of the proportions of KH_2PO_4 , MgSO_4 , and NaNO_3 in the nutrient solution on the production of penicillin in surface cultures, R. PRATT (*Amer. Jour. Bot.*, 32 (1945), No. 8, pp. 528-535, illus. 8).—A study was made of the accumulation of penicillin in cultures of *Penicillium notatum* grown in 65 nutrient solutions containing KH_2PO_4 , $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, and NaNO_3 in different proportions but all with a total molar concentration of these three salts of 0.04 M. Besides lactose, the solutions contained corn-steep liquor, ZnSO_4 , and phenylacetic acid. The results emphasize the importance of obtaining a proper balance among the concentrations of PO_4^{3-} , Mg^{++} , SO_4^{--} , and NO_3^- in the solutions if maximum yields of penicillin are desired. For a given level of PO_4^{3-} , as the concentration of Mg^{++} and SO_4^{--} was raised, it was necessary to lower the concentration of NO_3^- . From the standpoint of penicillin production, the best solutions contained not less than 8 mM KH_2PO_4 per liter and not more than 20 mM NaNO_3 per liter. The absolute concentrations in the optimum solution in this series were KH_2PO_4 , 0.019 M; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 0.002 M; and NaNO_3 , 0.019 M. The proportions of the three salts in the optimum solution were KH_2PO_4 , 0.475; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 0.05; and NaNO_3 , 0.475. In a series of solutions with these relative concentrations for the three salts, maximum potency on the seventh day was obtained at a total concentration of 0.12 M.

On a synthetic medium for the production of penicillin, A. G. C. WHITE, L. O. KRAMPITZ, and C. H. WERKMAN. (Iowa State Col.). (*Arch. Biochem.*, 8 (1945),

No. 2, pp. 303-309).—The production of penicillin by *Penicillium notatum* on a chemically defined medium is indicated, giving 80-90 percent of the titer obtained on the usual corn steep liquor medium. The latter was fractionated and some characteristics of the stimulatory materials were determined. This material was found soluble in 60 percent alcohol, not hydrolyzed in 30 percent H_2SO_4 or 30 percent NaOH, precipitated largely by picric acid, and not extracted by butyl alcohol after 180 hr. The amino acids appeared to be responsible, at least in part, for the stimulatory activity of corn steep liquor, arginine, histidine, and glutamic acid at 30, 30, and 400 mg. per 100 cc. apparently providing a large proportion of such activity.

Microbiological aspects of penicillin,—V, Conidiospore formation in submerged cultures of *Penicillium notatum*, J. W. FOSTER, L. E. MCDANIEL, H. B. WOODRUFF, and J. L. STOKES (*Jour. Bact.*, 50 (1945), No. 3, pp. 365-368, illus. 3).—Occasional cultures were obtained with shaking and aeration which, after a certain stage of development, exhibited a greenish cast quite unlike the yellow water-soluble chrysogenin commonly formed. Microscopic examination revealed that typical conidiospore formation had occurred; this was responsible for the green pigmentation. This is believed to be the first report of spore formation in submerged cultures by *Penicillia* and, for that matter, by *Fungi Imperfecti* as a whole. The physiological behavior of these spores with respect to growth and penicillin formation was identical with that of surface spores. The nature of the medium appeared to govern whether spores or only mycelium developed in depth culture; the specific factors responsible cannot as yet be defined, but the presence of a rather high concentration of the Ca ion was apparently the most important agent concerned.

Antibiotics, other than penicillin, produced by *Penicillia*, J. S. KISER and J. S. ZELLAT (*N. Y. Acad. Sci. Trans., Sect. II*, 7 (1945), No. 8, pp. 210-219).—A lecture discussing clavacin, penicillic acid, spinulosin, penatin, citrinin, and punerulic and perubulonic acids from various species of *Penicillium*.

Streptomycin—origin, nature, and properties, S. A. WAKSMAN and A. SCHATZ. (N. J. Expt. Stas.). (*Jour. Amer. Pharm. Assoc., Sci. Ed.*, 34 (1945), No. 11, pp. 273-291, illus. 3).—The story of streptomycin here given (53 references) is the story of a search for an antibiotic active against gram-negative bacteria and exerting its effect not only in the test tube but also in the animal body, yet not very toxic nor exerting otherwise undesirable effects on the body, a substance that would not be inactivated by body fluids and therefore would offer chemotherapeutic potentialities. The authors consider the isolation of *Streptomyces griseus*—producer of streptomycin, the production, isolation, and activity of this antibiotic, methods of assay, its chemical and biological properties, its antibacterial action in vitro, the pharmacology, toxicology, and effectiveness of streptomycin in animals, and the toxicology and pharmacology in man, and its uses in chemotherapy. A tabulation of the range in sensitivity of different bacteria and actinomycetes to the bacteriostatic action of streptomycin is included.

Production of tyrothricin in cultures of *Bacillus brevis*, J. C. LEWIS, K. P. DIMICK, and I. C. FEUSTEL. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 10, pp. 996-1004, illus. 8).—Yields of tyrothricin in excess of 2 gm. per liter of medium were obtained through the growth of *B. brevis*; maxima were found after 10 to 16 days' incubation at about 35° C. with the medium disposed in 11-mm. layers. Complex N sources, such as Bacto tryptone, acid hydrolyzate of casein, corn-steep liquor, tryptic digest of soybean meal, or press juice concentrates from waste asparagus butts proved most suitable; relatively simple substances, such as glutamic acid, asparagine, or $(\text{NH}_4)_2\text{SO}_4$ plus citric or malic acids, proved moderately effective in the presence of 0.2 percent Bacto tryptone. About 3 to 5 percent of a fermentable C compound, such as glucose, mannitol, or glycerol, was needed for best yields; fructose, sucrose, lactose, or maltose proved much less effective. Require-

ments for Ca, Mg, and Mn were demonstrated. Unlike the other N sources named, properly processed asparagus concentrates yielded nutritionally complete media without added sugar or inorganic elements.

An antibiotic from a bee pathogen, E. C. HOLST. (U. S. D. A.). (*Science*, 102 (1945), No. 2658, pp. 593-594).—When the scales from honeybee larvae dead of foulbrood were seeded in nutrient agar plates containing soil suspension, market milk, or various pure cultures of gram-negative, gram-positive, and acidfast bacteria, inhibition zones were produced around the scales. What appeared to be an identical antibiotic was produced in culture by *Bacillus larvae*, but only when sporulation occurred. Some of the properties of the antibiotic are given in this preliminary report.

The antiseptic properties of surface active agents, L. H. FLETT (*Oil & Soap*, 22 (1945), No. 10, pp. 245-249, illus. 3).—Among the promising new synthetic detergents, products are said to be available which can be used in neutral or acid solutions to give a much stronger antiseptic action than is possible with ordinary soap solutions. These new materials are considered especially valuable because a really worth-while antiseptic is obtained from products which are nontoxic; they are also said to be stable under storage and to dissolve rapidly for use.

The fungistatic and fungicidal action of fatty acids and related compounds, O. WYSS, B. J. LUDWIG, and R. R. JOINER (*Arch. Biochem.*, 7 (1945), No. 3, pp. 415-425).—In tests with a number of saturated and unsaturated fatty acids and related compounds, the long chain acids proved superior to other acids and related derivatives, both in their inhibition of fungus growth and killing of fungus spores.

Sur la culture des champignons inférieurs et en particulier du *Penicillium notatum* sur des milieux formolés [Culture of the lower fungi and particularly *P. notatum* on media containing formol], G. RAMON and R. RICHOU (*Compt. Rend. Acad. Sci. [Paris]*, 220 (1945), No. 9, pp. 265-267).—Formol in serums and anatoxins has been found to act as an excellent antiseptic against bacteria but has proved incapable of playing this role against contamination by the lower fungi. Certain of these fungi such as *P. notatum* were shown to grow abundantly in nutrient media containing an amount of formaldehyde sufficient to prevent the growth of most bacteria. If later it be established that this does not impede the elaboration of penicillin or interfere with its therapeutic properties, this technic should provide a valuable aid in the industrial production of penicillin.

Growth requirements of *Penicillium digitatum*, R. C. WOOSTER and V. H. CHELDELIN. (Oreg. State Col.). (*Arch. Biochem.*, 8 (1945), No. 2, pp. 311-320, illus. 1).—At pH 3 (the approximate optimum) maximum growth occurred on a medium containing vitamin-free hydrolyzed casein as the only ingredient of unknown composition. The carbohydrate requirements were well satisfied by sucrose, glucose, fructose, or galactose; poor to vanishing growth was obtained with various organic acids; the best N sources tried were asparagin and hydrolyzed casein, especially in combination; peptone, aspartic acid, or NH_4 salts supported moderate growth. The thiazole moiety of thiamine was required; quantitative growth curves for thiamine may be obtained over the range 0.01 γ -3 γ per 25 cc.; pyridoxine, pantothenate, and biotin proved stimulatory. At and above pH 6.5 above the second optimum for *P. digitatum*, the effect of biotin was more pronounced than at pH 3. In the presence of 0.01 γ per 25 cc., the upper limit of growth was extended approximately 1 pH unit. Growth in this pH range was also markedly stimulated by an unidentified factor present in orange rind. Various properties of this factor have been described but its concentration has not been effected, since at this pH the fungus is unsatisfactory for quantitative assay.

Some factors affecting the production of itaconic acid by *Aspergillus terreus*, L. B. LOCKWOOD and M. D. REEVES. (U. S. D. A.). (*Arch. Biochem.*, 6 (1945), No. 3, pp. 455-469, illus. 9).—Of 308 strains of *A. terreus*, 11 gave yields of itaconic

acid from glucose in excess of 45 percent of theory; this acid accumulated in cultures in the pH range below 2.3 and was metabolized by the organism especially at pH values above 2.3; the optimum pH for accumulation was lower than that for growth of the fungus. The optimum concentration of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ for itaconic acid accumulation was about 4.5 to 5 gm. per liter; this salt may play various roles in this fermentation, such as essential nutrient, counteract of Al toxicity, and means of reducing the minimum pH at which growth and fermentation occur. Mn, Cu, Co, Mo, Ni, Cr, Ga, and borate ions at the concentrations tried caused no significant increases in growth or acid production at initial pH 2, 2.5, or 3. Fe and Zn—added to culture solutions together or each alone—resulted in a marked increase in itaconic acid production; this effect was not additive. At pH 3, if the concentration of added Zn was 1 mg. per liter or more and that of added Fe was 10 mg. per liter or more, growth was greatly increased but no itaconic acid accumulated. If either Fe or Zn or a mixture of the two was supplied in lower concentrations, good yields of itaconic acid were obtained. At the low initial pH 7.1, a high Fe concentration was much more effective than that of Zn in bringing about accumulation of this acid. The present preferred method of itaconic acid production in laboratory equipment involves the culture of *A. terreus* (NRRL 1960) at 30° C. for 12 days on a culture solution of the composition glucose 250 gm., $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ 4.5 gm., NH_4NO_3 2.5 gm., NaCl 0.4 gm., $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ 0.0044 gm., HNO_3 (sp. gr. 1.42) 1.60 cc., concentrated corn-steep liquor 4.0 cc., and distilled water to make 1000.0 cc.

A new fermentation method for mycological identification. F. RAUBITSCHKE (*Jour. Bact.*, 50 (1945), No. 3, pp. 337–339, illus. 1).—The simple and economic method described and illustrated is said to permit determination of the fermentation of sugars by *Monilia* spp.

Brazilian chytrids.—VII, Observations relative to sexuality in two new species of *Siphonaria*, J. S. KARLING (*Amer. Jour. Bot.*, 32 (1945), No. 9, pp. 580–587, about 53 illus.).—In continuation (E. S. R., 92, p. 517), *S. peterseii* and *S. sparrowii* were found to occur as saprophytes in insect exuviae in Brazil and the United States. Present observations indicate that the resting spores develop as the result of union of minute isomorphic thalli through anastomosis of rhizoids or conjugation tubes. After union, the content of one thallus flows into the body of another, and the fused protoplasts develop into the zygote. Frequently, more than one of the so-called male thalli fuse with the female. In germinating, the zygote of *S. sparrowii* gives rise to a thin-walled sporangium which produces posteriorly uniflagellate cells. Although no accurate chromosome counts were made, observations on living material suggest that these two species have well-marked alternations of monoploid and diploid generations.

A catalog of Illinois algae. M. E. BRITTON (*Evanston, Ill.: Northwestern Univ.*, 1944, pp. 177+, illus. 1).—An annotated classified listing with a review of the literature (7 pages), introductory discussion, and foreword by L. H. Tiffany.

Suggested terms for the interpretation of speciation phenomena. S. D. RIPLEY (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 11, pp. 337–341).—A number of terms are discussed by which various types of speciation may be described; it is suggested that these be considered as auxiliaries to the main nomenclature of genus, species, and subspecies. It is further recommended that all evidence of unusual cases of speciation phenomena be pointed out and described by scientific writers so as to widen and extend the literature and thus promote further study. There are 26 references.

A new section Microphyllae in Agrostis. A. A. BEETLE. (Univ. Calif.). (*Bul. Torrey Bot. Club*, 72 (1945), No. 6, pp. 541–549, illus. 8).—The new section of the Gramineae contains four species, including one new species and two new varieties.

The Navajo Yucca, a new species from New Mexico. J. M. WEBBER. (U. S. D. A.). (*Madroño*, 8 (1945), No. 4, pp. 105–110, illus. 3).—*Y. navajoa* n. sp. is described and illustrated.

A new species of *Linum* from the coast ranges of California, H. K. SHARSMITH. (Univ. Minn.). (*Madroño*, 8 (1945), No. 4, pp. 143-144).—*L. bicarpellatum* n. sp. is described.

Distribution of Euphorbiaceae in Iowa, with seed keys, M. R. MURLEY. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 4, pp. 415-427, illus. 34).—One key to the genera and three to the species—many of which are of economic significance—are presented along with distributional maps and brief discussion.

Additions to the oak flora of El Salvador, J. M. TUCKER and C. H. MULLER. (Univ. Calif.). (*Madroño*, 8 (1945), No. 4, pp. 111-117, illus. 2).—Includes one new species of *Quercus*.

Contributions to the flora of central New York, I, S. J. SMITH (*N. Y. State Mus. Bul.* 338 (1945), pp. 74).—This copiously annotated list deals with new, rare, or otherwise interesting elements in the flora of central New York State.

Use of the airplane in vegetation surveys, D. W. JENKINS. (Univ. Minn.). (*Ecology*, 26 (1945), No. 4, pp. 413-414).

Some morphological characteristics of nodule bacteria as shown by the electron microscope, II, M. B. BAYLOR, M. D. APPELMAN, O. H. SEARS, and G. L. CLARK. (Ill. Expt. Sta.). (*Jour. Bact.*, 50 (1945), No. 3, pp. 249-256, illus. 3).—In further studies (E. S. R., 90, p. 28), soybean and sweetclover strains of *Rhizobium leguminosarum* grown as stock cultures on agar slants were compared with freshly isolated strains from these two hosts. When cells treated with certain cytological reagents adapted to nuclear examination with the optical microscope were examined under the electron microscope they showed bodies which may have been nuclei. The same techniques revealed differences between the sweetclover and soybean strains in some features of their internal structure.

Auxin, the plant-growth hormone, II, F. W. WENT (*Bot. Rev.*, 11 (1945), No. 9, pp. 487-496).—This supplement (94 references) to the critical review previously noted (E. S. R., 74, p. 176) considers a few trends in the field, laying more stress "on the theoretically important points than on the practical ones, since another review in this journal . . . on growth hormones has been announced." The same subdivision is followed as in the original review. For detailed information the reader is referred to the other sources.

Wirkungen von Vitaminen und Antivitaminen auf Samenkeimung und Mitose [Effects of vitamins and antivitaminas on seed germination and mitosis], H. v. EULER and A.-M. PERJE (*Arkiv Kemi, Min. och Geol.*, 20A (1945), No. 1, Art. 2, pp. 1-17).—The authors present a brief review of the literature (bibliographic footnotes), with some observations on the influence of acidity of the medium on seed germination and mitosis and on the methods of study used, and the findings from experiments with sulfanilic acid and the sulfonamides, colchicine—including pretreatment with X-rays, growth substances of vitamin and of plant-hormone character, and polyploidy and mitosis disturbances induced by other substances.

A contribution to the knowledge of the breaking of winter dormancy in buds of woody plants, A. A. RICHTER and T. A. KRASNOSSELSKAYA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 47 (1945), No. 3, pp. 218-219).—The experiments with ash and lime trees reported appear to demonstrate that the main role in the breaking of dormancy in woody plants is played by stimulatory agents of plant hormone type.

The effect of the moisture content of the soil upon the rate of exudation, J. J. McDERMOTT. (U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 9, pp. 570-574, illus. 2).—Measurements of the exudation rate of detopped root systems of sunflower grown in a sandy loam were made, and the soil moisture content was determined for five groups totaling 162 plants. Within a moisture content range just above the wilting percentage of the soil, the detopped root systems lost water to the surrounding soil; with increased soil moisture, this rate of negative exudation

decreased, became zero, and positive exudation began, increasing to a maximum at about the moisture equivalent; soil moisture contents higher than this resulted in a decrease in the exudation rate—probably due to the poorer aeration and especially the high CO_2 content accompanying any further increase in soil moisture. Exudation stopped at an average of 14 percent soil moisture; from this result, calculations indicated that the lower 60 percent of the soil moisture in the range from wilting percentage to moisture equivalent was unavailable to the detopped root systems. A parabolic-type equation was derived which expresses the relationship between the rate of exudation and the soil moisture content and the square of the soil moisture content for each of the five series of observations and for all taken together. Four of the five showed a significant relationship between the square of the soil moisture content and the exudation rate; one series showed no significant relationship at all.

Absorption, transport, and exudation of inorganic ions by the roots, H. LUNDEGÅRDH (*Arkiv Bot.*, 32 (1945), No. 12, pp. 1-139, illus. 22).—The experimental work in this monographic study was done on the root systems of wheat seedlings, and the findings are presented and discussed in great detail. The plasma membrane of cells—endowed with a mechanism of performing accumulation processes—behaves as an amphoteric colloid with predominating acid dissociation. Free permeation of salt ions through the neutral main substance of the membrane occurs only to a limited extent in the root; the passage of ions in and out is regulated principally by exchange processes obeying the principle of membrane equilibrium and the law of mass action. The accumulation of free salts against the diffusion gradient cannot, however, be explained by adsorption or ion exchange alone. The level of salt concentration in a cell is to be regarded as a dynamic equilibrium between passive exudation and active absorption. Exudation dominates in the central parenchyma of the apical part of the stele; absorption, in the peripheral cells. Bleeding is a passive exudation of salts which have been actively accumulated in the epidermis and transported in a centripetal direction; an exudation of "extra water" also occurs, owing to metabolic processes in the stele. The active absorption of salts is causally connected with the anion respiration. No direct relation was observed between absorption of ions and protein synthesis or growth intensity. The plasma of young cells—capable of growth or just outgrown—seems, however, to be endowed in a general way with the ability to do accumulation work.

A theory of the anion respiration is developed, according to which the transport of anions as an accessory process is associated with the change of valency of iron atoms in a respiratory hemin system. This theory—discussed in great detail in connection with the experimental work and the literature (2.5 pages of references)—explains the sensitivity of the anion absorption to cyanide and to the low oxygen pressure. The cations of a salt are more "passively" adsorbed in the protoplasm owing to its dominating acid dissociation. A certain minimum power of anion respiration is necessary to maintain the accumulation of inorganic salts in a cell. The permeability of the root tissue to water is slightly influenced by cations. The bleeding of decapitated plants is the visible sign of a normally occurring continuous exudation of liquid into the central vessels of the root ends. The total bleeding is the sum of exuded salt solution plus extra water. According to the theory, exudation of solution occurs if osmotically active substance is given off from a cell. The bleeding sap of wheat seedlings is a slightly acid inorganic salt solution. The concentration of the sap is not influenced by the osmotic value of the medium (in 6 hr.); only the supply of ions to the exuding parenchyma is of deciding influence. According to the theory, the sap concentration reflects the osmotic properties of the exuding cells. The intensity of the bleeding results from a number of factors, which are discussed, and the relation between osmotic value of the medium and intensity of bleeding

is expressed in a formula. New viewpoints are developed concerning the migration of solutes in the plant and the participation of metabolic processes in water movement. A number of analyses of the guttation water are given. A limited "desalting" probably occurs in the older parts of the roots and in the base of the stem.

Nouvelles observations, par l'analyse périodique de la feuille, sur l'absorption de la potasse chez quelques plantes pérennes [New observations through periodic analysis of the leaves on the absorption of potassium in some perennial plants], L. MAUME and J. DULAC (*Compt. Rend. Acad. Sci. [Paris]*, 220 (1945), No. 8, pp. 257-259).—The nutritive effects of K as measured by its accumulation in leaves of the grapevine and of apricot and plum trees manifested itself in varying degrees according to the season, but always most sharply at the end of vegetable growth. The last samples of leaves taken were those which on analysis revealed the most significant figures, apparently indicating that at the close of vegetative growth the test plants lived principally on their reserves of K_2O accumulated in the wood during the period of retarded activity. This method of observation—which reveals the remarkable chemical plasticity of the leaf—enables estimations to be made of the influence of certain cultural operations on the physiology of various perennial plants.

Critical periods in the uptake of potassium by sugar-beet, T. T. DEMIDENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 47 (1945), No. 3, pp. 215-217).—The author found that exclusion of K from sugar beets during early development (4 to 7 pairs of leaves) results in reduced yields and impaired quality of the crop. A critical period for K uptake is that of intense sugar accumulation (7 to 10 pairs of leaves). Deficiency in the K supply results in a decreased foliage area and a reduced sugar output. Exclusion of K during the growing period increases the colloid content of the cell sap; a deficiency during the second half of the growing period results in an increase in soluble N. The maximum uptake of nutrients by the sugar beet is said not to coincide with the critical periods of the K nutrition.

Inhibition of cellular oxidation by fluoride, H. BOREI (*Arkiv Kemi, Min. och Geol.*, 20A (1945), No. 2-3, Art. 8, pp. 1-215, illus. 42).—This monographic study concerns questions relating to the inhibition by fluoride of the oxidative processes in the cell taking place through the cytochrome system. Some chemical and physical properties of the fluoride ion are discussed, together with certain quantitative methods for determining fluoride. It is well known that fluoride has a great capacity to inhibit processes catalyzed by metallic ions or metal-containing enzymes; this property is especially marked for Fe, Mn, and Mg. It is also known that fluoride has a general toxic effect on living animal and plant cells; analytic values for the F contents of plant and animal material are cited, and an exhaustive review of the literature (6.5 pages of references) on the effects of fluoride on enzymic processes is presented. Detailed methods, materials, and findings are given with respect to localization of the fluoride-sensitive link in the cellular respiration chain, the mechanism of fluoride attack, and the cytochrome system and its components.

Silicon absorption by rye and sunflower, R. T. WHITTENBERGER (*Amer. Jour. Bot.*, 32 (1945), No. 9, pp. 539-549, illus. 2).—Silicon, supplied as sodium silicate, was absorbed by both species at all seasons about in proportion to its concentration in the nutrient solution. At 450 p. p. m. the plants accumulated Si primarily in the roots; at 150 p. p. m. or less accumulation in the shoots and especially in the leaves was favored. This relation held for both liquid and solid media; no plausible explanation was obtained from transpiration or solubility data. The greater, though variable, portion of Si in the plants was in insoluble form. Of the two species, rye always took up the more. Even at high concentrations, soluble Si was not toxic. Under some conditions of culture and climate, growth was improved; under others, it was not. Between pH 3.6 and 7.1, maximum absorption of soluble Si forms

occurred at approximate neutrality. The effect of pH on growth varied with the season: During spring, pH 7.1 produced maximum growth of both species; during winter, yields were best at pH 4.6 and pH 7.1 Si was toxic to rye. Evidence is presented that no colloidal Si was absorbed, that the roots secreted a Si-dissolving substance of molecular dimensions, and that this substance is probably CO_2 —shown capable of dissolving appreciable amounts of Si from various soils containing silicates, but not from quartz sand. The author concludes that under natural conditions Si is probably absorbed mainly as temporarily soluble silicic acid and as soluble silicates arising from decomposition of complex silicates. These findings emphasize and broaden the role plants serve in weathering and soil building.

The role of amino acids and amides in the metabolism of ammonium absorbed by *Zea mays* L., F. G. VIERS, Jr. (S. Dak. Expt. Sta.). (*Science*, 102 (1945), No. 2658, pp. 587–589).—When corn seedlings previously depleted in soluble N constituents were forced to absorb large amounts of ammonium N, soluble compounds accumulated in the sap and substantial growth was made. Asparagine, glutamine, one or more amino acids, and undetermined compounds were synthesized; ammonia did not accumulate until these constituents had reached a relatively high level.

Effects of hydroxyl on negative and positive cells of *Nitella*, W. J. V. OSTERHOUT (*Jour. Gen. Physiol.*, 29 (1945), No. 1, pp. 43–56, illus. 4).—Remarkable changes were induced by KOH in transforming negative cells of the alga *Nitella* (showing dilute solution negative with KOH) to positive cells (showing dilute solution positive with KOH); NaOH proved less effective. This result might be explained on the ground that the protoplasm contains an acid (possibly a fatty acid) which makes the cell negative and is dissolved out more rapidly by KOH than by NaOH, as happens with the fatty acids in ordinary soaps. Part of the negative cell can be changed to positive by exposure to KOH while the untreated part remains negative. After exposure to KOH the potential which the protoplasm has when in contact with NaCl may increase; at the same time there may be an increase in the K effect—i. e., the change of potential difference in a positive direction as observed when 0.01 M of KCl is replaced by 0.01 M of NaCl. In some cases the order of ionic mobilities is $u_K > v_{OH} > u_{Na}$, showing that the protoplasmic surface cannot be a pore system, for in such a system all cations must have greater mobilities than all anions and vice versa.

The effect of colchicine and acenaphthene in combination with X-rays on plant tissue.—I, Introduction, M. LEVINE (*Bul. Torrey Bot. Club*, 72 (1945), No. 6, pp. 563–574).—This introductory section represents a general review of published contributions on the subject, including the effects of colchicine on plants, colchicine and X-rays, acenaphthene and other substances, colchicine in cytology, irradiation with X-rays, and the function of colchicine for tumor therapy. Because of the large number of reports on colchicine, only those illuminating the salient features of the problem are alluded to in this contribution, and emphasis is given to those studies dealing with its effects alone or in combination with X-rays on animal and plant hyperplasias.

Light as an ecological factor and its measurement, II, H. L. SHIRLEY (*Bot. Rev.*, 11 (1945), No. 9, pp. 497–532).—Supplementing a previous contribution (E. S. R., 74, p. 611), the discussion in this critical review (188 references) is subdivided as follows: Light measurement, light climate, light requirements for photosynthesis, interrelationships between light and other factors, and light as influencing plant succession.

Photoperiodism of individual parts of the leaf, its halves, M. C. CAJLACHJAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 47 (1945), No. 3, pp. 220–224, illus. 8).—The processes induced by the short day in a short-day plant (*perilla*) and

by the long day in a long-day plant (spinach) are found due to the hormones associated with flowering. These hormones—arising in the apical half of the leaf—encounter in their migration the inhibitory effect of the long day zone (leaf base in perilla) and of the short day zone (in spinach). This arrest can be explained neither by dispersion of the flowering hormones in the cells of the leaf base nor by extension of the distance they have to pass, for darkness (with perilla) failed entirely to remove this obstacle. The solution of the problem may be sought in studies of the physiological nature of this barrier—in the relations between the processes arising under long- or short-day conditions. The method of differential light imposed on individual parts of the leaf—as here described—may prove highly adapted to such studies, since it permits a close juxtaposition of the short- and long-day zones of the leaf.

Flowering behavior and natural distribution of the eastern ragweeds (*Ambrosia*) as affected by length of day, H. A. ALLARD (*Ecology*, 26 (1945), No. 4, pp. 387–394).—*A. artemisiifolia* and *A. trifida* were subjected to photoperiods much longer than critical for flower induction, as well as to very short photoperiods. On the very long photoperiods the plants produced only staminate inflorescences; the short photoperiods reduced the production of staminate flowers and increased that of the pistillate. Under extreme conditions of reduced day-length the plants were greatly dwarfed, in some instances growing only a few inches tall and producing only pistillate flowers; a few plants developed only vegetatively. Field observations revealed a normal trend toward femaleness in *A. artemisiifolia* in late summer and fall. This appeared to be accentuated by drought, which retards growth and causes dwarfing; both shortening of days and drought have dwarfing effects. These results and conclusions agree with those of Mann on *A. trifida* (E. S. R., 88, p. 32).

Developmental lines in pollination mechanisms in the Coniferales, J. DOYLE (*Roy. Dublin Soc., Sci. Proc., n. ser.*, 24 (1945), No. 1–5, pp. 43–62, illus. 4).—This paper is concerned solely with the relationships between types of pollination mechanisms in living and fossil genera of Coniferales; it is not concerned with problems such as the immediate phyletic relationships of individual fossil and living forms.

Pollen-tube growth in intergeneric pollinations on *Datura stramonium*, C. SANZ (*Natl. Acad. Sci. Proc.*, 31 (1945), No. 11, pp. 361–367).—In attempts to obtain intergeneric crosses, many barriers rendering them unsuccessful have been found. All tests in the present study were made on stigmas and styles of *D. stramonium*. Pollens of members of the Solanaceae germinated more successfully than those of other families (93 against 43 percent). The fact that pollen of species in such distant groups as the monocotyledons germinated on stigmas of *Datura* apparently demonstrates that pollen germination is not determined exclusively by taxonomic relationships. The Solanaceae averaged faster pollen-tube growth than members of other families tested (10.8 against 5 mm.). In the latter group, however, individual cases of relatively rapid pollen-tube growth were encountered. Use of tetraploid styles increased slightly the speed of growth and decreased the proportion of bursting pollen tubes, especially in tomato, thereby raising the chances that tubes would reach the ovary. Attempts to shorten the distance from stigma to ovary induced the pollen tubes to approach closer to the ovary; in one case the tubes arrived at the ovary; in none did they enter it.

Cell number in successive segments of *Avena* coleoptiles of different ages: Material for the biochemist, G. S. AVERY, JR., M. PIPER, and P. SMITH (*Amer. Jour. Bot.*, 32 (1945), No. 9, pp. 575–579, illus. 2).—The total number of cells, exclusive of the vascular bundle, is reported for successive segments of etiolated *Avena* coleoptiles of different ages. Data are presented for segments 75 μ , 100 μ , and 125 μ

in thickness, cut from coleoptiles 1.5, 3.8, 8.3, and 14 mm. long. Living coleoptiles may be imbedded in paraffin and sectioned at these thicknesses for enzyme or other determinations; thus the cell numbers here recorded may be used wherever there is reason to express biochemical data on a per-cell basis in any part of the coleoptile.

Cell elongation and the development of root hairs in tomato roots, R. G. H. CORMACK (*Amer. Jour. Bot.*, 32 (1945), No. 8, pp. 490-496, illus. 15).—Evidence obtained by measuring the epidermal cell walls of tomato roots indicated that the cells are still growing in the region where the papillae first appear. Additional evidence from use of various aqueous solutions further demonstrated that the capacity to form hairs is determined by chemical and physical changes occurring while the cells are still elongating. A hair emerges as a wide bulge near the apical end of a cell where the wall is more plastic. When the walls harden slowly the more plastic nature of the apical end allows for further longitudinal extension of the cell after the bulge pushes out; the papilla thus occupies a central position in the full-grown cell. Conditions which speed up calcification of the middle lamellae inhibit further elongation at the apical end, growth becomes localized in the bulge, and a long straight hair results. The epidermal cells of tomato roots are all of the "long-cell type," not well adapted to produce hairs under most conditions in aqueous solutions. It is only under limited conditions, where calcification takes place progressively but rapidly, that all the cells remain short and produce long hairs.

Histology of barks of Cinchona and some related genera occurring in Colombia, R. R. LITTLE ([U. S.] *Foreign Econ. Admin., Gen. Commod. Div.*, [1945], pp. 73+, illus. 27).—This is a preliminary report of studies made by the author in Bogotá, Colombia, 1944-45. The object was to facilitate identification of barks yielding cinchona alkaloids and to distinguish them from the false barks commonly mistaken or substituted for them, to correlate microscopic characters of bark with area of origin and with morphological variations of *Cinchona* spp., and to study the bark characters of *Cinchona* hybrids.

Studies in the developmental anatomy of Phlox drummondii Hook.—I, The embryo, H. A. MILLER and R. H. WETMORE (*Amer. Jour. Bot.*, 32 (1945), No. 9, pp. 588-599, illus. 44).—The development in situ of embryos of *P. drummondii* was studied in successive stages from the first divisions of the zygote to the embryo of the mature plant; the findings are here described and illustrated.

Origin and development of sclereids in the foliage leaf of Trochodendron aralioides Sieb. & Zucc., A. S. FOSTER. (Univ. Calif.). (*Amer. Jour. Bot.*, 32 (1945), No. 8, pp. 456-468, illus. 28).—A large number of angiosperms are characterized by the presence of ramified sclereids dispersed in a variety of patterns in the "fundamental tissue system" of the foliage leaf. In an effort to contribute to this "greatly neglected aspect of plant histogenesis," a detailed ontogenetic study was made of the foliar sclereids of this species, selected because its sclereids are remarkably polymorphic (they occur in the highly lacunate tissues of the petiole and lamina) and because information on the developmental history of these distinctive sclereids would contribute further to the enlarging knowledge of "a remarkable and, in many respects, unique dicotyledon."

Habit of growth of Rubus rosaefolius Smith in Hawaii, C. J. ENGARD. (Univ. Hawaii). (*Amer. Jour. Bot.*, 32 (1945), No. 8, pp. 536-538, illus. 3).—The growth habit was studied in 14 plants of this species. The plant is perennial and produces 4 to 5 canes during a given year. These canes originate from a node near the basal end of a previously fruiting cane or from the crown at ground level; each passes through a vegetative and then a fruiting stage, the sequence being of only a few months' duration. Flowering, fruiting, and death of each cane are basipetal. Terminology as applied to the Rubi is discussed. The terms primocane and floricanes, originally applied to the biennial temperate zone Rubi, are found unsuitable for use

in reference to *R. rosaefolius* in Hawaii. The term paucirame, a branch of few months' duration, is suggested for this species. The colony of *R. rosaefolius* increases in size via horizontal roots from which new shoots arise

GENETICS

A new waxy allele in corn and its effect on the properties of the endosperm starch. B. BRIMHALL, G. F. SPRAGUE, and J. E. SASS. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 11, pp. 937-944, illus. 3).—A mutant in corn (wx^a) produced starch having 97.4 amylose, the branched chain component. Intercrosses of wx^a with the two previously known, wx and Wx (E. S. R., 90, p. 323), exhibited different gene action dependent upon the characterization method used. Iodine staining reaction revealed decreasing dominance for the series Wx , wx^a and wx . Viscosity measurements indicated that gene action is predominantly additive. Amylose percentages showed geometric gene action in wx and wx^a intercrosses and a high degree of dominance in $wx^a \times wx$ intercrosses.

The theory and application of the backcross technique in cotton breeding. R. L. KNIGHT (*Jour. Genet.*, 47 (1945), No. 1, pp. 76-86).—Report is made on the author's experience of inter- and intraspecific backcrossing over a number of years, during which the blackarm resistance genes B_1 and B_2 from *Gossypium hirsutum*, the blackarm resistance gene B_3 from *G. punctatum*, and the *G. arboreum* gene R_xRS from Harland's *RU4 G. hirsutum* \times (*barbadense* \times *arboreum*) have been successfully transferred to two commercial strains of *G. barbadense*, while several intraspecific transferences have been made in *G. hirsutum*. The theory and technic are discussed in detail.

[Cotton genetics], S. G. STEPHENS (*Jour. Genet.*, 46 (1945), No. 2-3, pp. 303-357, illus. 27).—Contributions from the cotton research station at Trinidad, B. W. I., include: Colchicine-Produced Polyploids in *Gossypium*:—II, Old World Triploid Hybrids (pp. 303-312) (E. S. R., 89, p. 196); A Genetic Survey of Leaf Shape in New World Cottons—A Problem in Critical Identification of Alleles (pp. 313-330) (E. S. R., 91, p. 666); The Modifier Concept—A Developmental Analysis of Leaf-Shape "Modification" in New World Cottons (pp. 331-344); and Canalization of Gene Action in the *Gossypium* Leaf-Shape System and Its Bearing on Certain Evolutionary Mechanisms (pp. 345-357).

The inheritance of three genes that influence time of floral initiation and maturity date in milo, J. R. QUINBY and R. E. KAPER. (Tex. Expt. Sta.) (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 11, pp. 916-936, illus. 3).—Three genes were found to influence time of floral initiation and maturity date in milo (*Sorghum vulgare*). Lateness is dominant to earliness, but the second and third genes, Ma_2 and Ma_3 do not express themselves except in the presence of dominant Ma . Four phenotypes have been designated Early, Intermediate, Late, and Ultralate. Ma was found to be linked with Dw_3 , which influences length of internode; and Ma_3 with R , which controls presence or absence of a red plant pigment. Action of Ma is influenced by photoperiod. When grown under 10-hr. photoperiods all four phenotypes were found to be identical. Ma_2 and Ma_3 could not express themselves if the plants were grown under 10-hr. photoperiods and not under 14-hr. photoperiods unless Ma was present in the dominant condition. A correlation existed between duration of growth and size of plant. A difference in two genes caused a twofold difference in plant size. These three genes, typical adaptation genes, determine the range in latitude and altitude as well as the rainfall belt in which a strain or variety can be grown successfully.

The comparative rates of growth of tetraploid and diploid sweetclover, *Melilotus alba* Desr., M. EVANS and I. J. JOHNSON. (Iowa Expt. Sta.) (*Jour. Amer.*

Soc. Agron., 37 (1945), No. 11, pp. 867-875, illus. 1).—In greenhouse studies of open-pollinated strains of 1-yr. selfed lines of sweetclover, four autotetraploids had significantly greater vigor than four diploids in early growth stages but the two types were not different in the adult plant stage. Differences in early stages were attributed to the larger seed size of the autotetraploids.

Cytoplasmically inherited male-sterility in sugar beets, F. V. OWEN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 10, pp. 423-440, illus. 3).—Male-sterility produced by combined cytoplasmic and genic inheritance was found in cross-pollinated varieties of sugar beets bred for resistance to curly top. Complete male-sterility was characterized by white, empty anthers. Inheritance of semi-male-sterility was found related to that of complete male-sterility. Assuming two types of cytoplasm, S for male-sterility and N for normal, and two Mendelian factors X and Z, most of the evidence, including striking differences from reciprocal crosses, indicates the following constitution: S $x x s s$ completely male-sterile, S X $x s s$ (or S $x x Z s$) semi-male-sterile, usually without viable pollen, and S X $x Z s$ semi-male-sterile, usually with some viable pollen. Indications were that more than two factors may influence the degree of semi-male-sterility. While instances of homozygosity for the factors were demonstrated, offspring from male-sterile (S $x s s$) females were never found to be homozygous for X or Z.

The male-sterile character in the curly-top resistant varieties of beets appeared to be relatively stable, but instances of cytoplasmic instability were encountered. Male-sterile sugar beets were found convenient for use as female parents in hybridization work, the nature of the inheritance making possible the production of completely male-sterile populations. With very few exceptions, male-sterile (S $x s s$) females \times selected N $x s s s$ hermaphrodites produced completely male-sterile offspring.

Some types of male-sterility in beets are evidently produced by genic rather than cytoplasmic inheritance. Male-sterility found in the Munerati annual beet and in the curly-top-resistant strain 12c did not appear to be inherited cytoplasmically.

Fertilization without reduction in guayule (*Parthenium argentatum* Gray) and a hypothesis as to the evolution of apomixis and polyploidy, L. POWERS. (U. S. D. A.). (*Genetics*, 30 (1945), No. 4, pp. 323-346, illus. 1).

The spontaneous origin of polyploid apples, J. EINSET. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 91-93).—Chromosome determinations made on root tip tissue of 1,740 seedlings with diploid parents revealed 4 seedlings with triploid and 3 with tetraploid numbers. Presumably the triploids originated through the functioning of an unreduced egg or possibly a pollen grain. The tetraploids may have arisen through the chance union of two unreduced gametes or through the somatic doubling of a zygote, more likely the latter.

An examination of 532 seedlings grown from open-pollinated seed of triploid apple varieties revealed 10 tetraploids with 68 chromosomes and 1 seedling with 71 chromosomes. The 71 chromosomes may have resulted from the union of an unreduced egg (51 chromosomes) plus a pollen grain of a triploid variety carrying 20 chromosomes. Of a total of 14 tetraploid plants that have been found, 12 are still living. Crosses are planned between these tetraploids and diploids in an effort to produce triploid varieties in adequate number to determine if such possess inherently superior qualities.

Field identification of genetically male-sterile tomato plants for use in producing F_1 hybrid seed, C. M. RICK. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 277-283, illus. 1).—A random sample of 66 unfruitful plants found in commercial fields of Early Santa Clara, Pearson, and San Marzano tomatoes was found to consist of 45 triploids, 14 diploids, 3 tetraploids, 2 trisomics, and 2 haploids. As the degree of ploidy increased from hapoidy to tetraploidy in the tomato, the

leaf shape changed from narrow to broad; the length-width ratio of fruits changed likewise, most noticeably in varieties having elongate fruits; the plant tended to branch less, and by virtue of increasing thickness, the leaves became darker green, rougher, and more brittle to the touch.

Leaf thickness provides a reliable index of the degree of ploidy, but is influenced by factors such as culture, temperature, and soil moisture.

The author discusses the use of male-sterile mutants in the production of hybrid seed. Pure lines may be produced readily from haploids, but since the ordinary tomato variety is a self-pollinated entity, pure lines would seem less important than in cross-pollinated crops.

Interaction of sex, shape, and weight genes in watermelon. C. F. POOLE and P. C. GRIMBALL. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 71 (1945), No. 12, pp. 533-552, illus. 5*).—In the watermelon the two characters fruit shape (*O* elongate v. *o* spherical) and plant sex habit (*A* monoecious v. *a* andromonoecious) are shown to be linked with a cross-over value ranging from 0.136 ± 0.029 for a backcross population of 140 plants to 0.207 ± 0.010 for segregating F_2 populations totaling 2,085 plants and to 0.350 ± 0.035 for an F_2 population of 301 plants.

Fruit shape and fruit weight are significantly correlated in three groups of crosses (including backcrosses), in the best designed population of which $r = -0.313$ from total sources of variance and -0.863 for the four sex-shape Mendelian phenotypes; but the two characters fail to show significant correlation in some other crosses. Linkage estimates are impossible because of multiple-factor determination of weight.

Weight data distributed according to sex phenotypes show weakly significant or nonsignificant differences between the mean weights from the two sex types, but linkage between sex type and one of the weight genes is probable in the particular cross studied.

Number of genes segregating for weight inheritance in the cross Northern Sweet (about 32 kg.) \times Dove (about 8.0 kg., heterozygous for weight) was estimated from the F_2 population at 25 genes and from the backcross to Northern Sweet at 12 genes.

Gene number estimation was made by comparison of the geometric mean and genetic standard deviation of the observed population with the geometric mean and standard deviation of the generalized binomial $[1 + (n+1)]^n$ when adjusted for differences in population frequency and spread.

When the true geometric mean of a segregating population is known, a good-fitting binomial can be made for any postulated number of genes; hence, the most probable number must be estimated according to the genetic standard deviation of the original uncorrected data.

Genetics of Glomerella.—III, Crosses with a conidial strain, S. J. P. CHILTON, G. B. LUCAS, and C. W. EDGERTON. (La. State Univ.) (*Amer. Jour. Bot.*, 32 (1945), No. 9, pp. 549-554, illus. 3).—In continuation (E. S. R., 93, p. 267), a plus strain from *Ipomoea* yielded a conidial strain not producing perithecia; this was crossed with strains of the plus and minus types. In crosses between plus A and conidial A, perithecia formed rather slowly; in those between conidial A strains of the minus type, perithecia developed more quickly. In crosses between plus A and conidial A, the ascospores produced cultures of plus A and conidial A strains. In crosses between conidial A and strains of the minus type, four different strains were usually obtained—among them another conidial strain termed conidial B.

Animal breeding plans. J. L. LUSH (Ames, Iowa: Collegiate Press, Inc., 1945, 3. ed., [rev.], pp. 443+, illus. 50).—A revised edition of the book previously noted (E. S. R., 89, p. 42).

Fused teats: A hereditary defect in beef cattle. L. E. JOHNSON. (S. Dak. Expt. Sta.). (*Jour. Hered.*, 36 (1945), No. 10, pp. 317-320, illus. 2).—A teat defect in which

the fore and rear teats on one side of the udder were fused together is described. The condition was found only in ♀♀, but the absence of this condition in the rudimentary teats of ♂♂ in this study does not prove that it is limited to ♀♀.

Identical cattle twins and causes of spotted patterns, A. DEAKIN (*Westboro, Ont.: Author, 1944, pp. 16, illus. 15*).—Data are presented on the characteristics of two sets of Holstein-Friesian calf twins thought to be monozygotic. In one set both calves were similar in color, temperament, body weight, and butterfat percentage of milk, but there was about 20 percent difference in milk yield. The other two calves were born dead and had developed in a common placenta. Certain other common characteristics were noted and modification of color characteristics in different spotted and multicolored species discussed.

Effects of some environmental factors on weanling traits of range Rambouillet lambs, L. N. HAZEL and C. E. TERRILL. (U. S. D. A.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 331-341).—Studies were made on the effects of sex, age of dam, year, breeding group, type of birth, age at weaning, and percentage of inbreeding on the weaning weights of 2,183 Rambouillet lambs born in 1941 and 1942 at the U. S. Sheep Experiment Station and Western Sheep Breeding Laboratory, Dubois, Idaho. The average age at weaning was 123.8 ± 11.1 days. Differences in weaning weight of the ♂ and ♀ lambs, singles and twins, and lambs from mature and those from 2-year-old ewes were 8.3, 9.2, and 6.1 lb., respectively. The body type and condition scores were higher for ewe lambs, single lambs, and lambs from mature ewes than contrasting groups. Ram lambs had more neck folds and more wool than ewe lambs. Weaning weight, staple length, and body type and condition scores improved with age at weaning and became poorer with increased inbreeding, as shown by regression coefficients. The factors studied had the greatest influence on weaning weight and the least on face covering, 49.5 and 5.6 percent, respectively, of the variance in these traits. It is suggested that the more important differences be considered in culling lambs to increase the improvement from selection, which may be accomplished by sorting the lambs according to sex, type of birth, age of dam, etc., or by adjusting weanling records. Progeny test records may be more accurately made after adjusting the important factors, particularly for the small numbers.

Heritability of weaning weight and staple length in range Rambouillet lambs, L. N. HAZEL and C. E. TERRILL. (U. S. D. A.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 347-358).—Estimates of heritability were calculated for weaning weight and staple length at weaning age on 2,183 lambs and 892 of their dams in the 1941-42 breeding flocks of the Western Sheep Breeding Laboratory, Dubois, Idaho. The methods of estimation were based on the half-sib correlation and the intra-sire regression of offspring on dam, modified to discount the effects on nonrandom mating systems. Some of the lambs were produced in inbred lines and some were produced by top-crossing inbred sires on noninbred ♀♀. The half-sib correlations were increased as compared with that expected in noninbred populations. Inbreeding causes a decrease, but top-crossing has no effect on the intra-sire regression of offspring on dam. Estimates of heritability by the intra-sire regression and by the half-sib correlation methods were reasonably consistent, indicating that the effects of the mating systems were adequately discounted. The estimates for heritability of weaning weight and staple length were, respectively, 0.30 ± 0.04 and 0.40 ± 0.05 . As the records had been adjusted for several environmental factors, accounting for about 50 and 20 percent of the variance in weaning weights and staple length, it appears that in the unadjusted data heritability of weaning weight and staple length may be no more than 0.15 and 0.32, respectively. Maximum gain expected from selecting for either weaning weight or staple length alone is about 0.9 lb. or 0.06 cm. per year. In allowances for emphasis on other traits, which is necessary in a properly balanced breeding program, gains will not be more than one-half or one-fourth of these figures.

Sexual development of range ewe lambs as affected by winter feeding, R. W. PHILLIPS, F. F. MCKENZIE, J. V. CHRISTENSEN, G. S. RICHARDS, and W. K. PETTERSON. (Utah Expt. Sta. and U. S. D. A.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 342-346).—The results of a study of lot feeding of range ewe lambs during the first winter indicate that the reproductive tract develops more fully as compared with the development of ewe lambs kept on open ranges. The results with 80 ewe lambs, together with earlier studies (E. S. R., 83, p. 235), in which larger lamb crops were produced at 2 yr. of age as a result of lot feeding during the first winter, indicated the desirability of giving special attention to the feeding of ewe lambs in range flocks. Determination of how far the rancher may go efficiently in this direction is discussed.

The effectiveness of gonadotropin injections followed by insemination in inducing pregnancy in ewes, M. KOGER. (N. Mex. Expt. Sta.). (*Endocrinology*, 37 (1945), No. 3, pp. 165-170).—"One of 2 ewes which were injected with pregnant mare serum during the anestrus period and force-bred 2 days later lambled as a result of treatment. Seven of 46 ewes which were injected with gonadotropin from P. M. S. [pregnant mare serum] or pituitary extract during the regular breeding season and inseminated on the second and/or third day following, lambled as a result of induced ovulation. Ewes which were inseminated near time of natural estrus were not counted. All the pregnancies occurred in 16 ewes which exhibited vaginal secretions at time of insemination similar to that observed in natural estrus. Four of 14 ewes injected with 5.0 mg. stilbestrol when estrus was not expected showed vaginal mucus partially similar to that of ewes in heat. One was receptive to the ram, but none conceived from insemination on second and third days. Eight of 14 ewes given simultaneous injections of P. M. S. and stilbestrol when estrus was not expected showed a thin vaginal mucus, and 3 of these conceived to insemination on the second and third days after injection. The natural rhythm of the cycle was not altered by hormone treatment given, and no harmful aftereffects were observed."

Following preliminary work the first study was conducted with 110 yearling Rambouillet ewes inseminated 1, 2, 3, or 4 days following hormone treatment. In the second experiment 60 ewes were divided into 4 groups of 15 each, 1 group of which served as negative controls. Another group received 5 cc. of pregnant mare serum, a third 5 mg. of stilbestrol, and another received 5 cc. of the pregnant mare serum plus 5 mg. of stilbestrol. An extensive bibliography of studies by Bell et al. (E. S. R., 85, p. 750) and by others on the induction of ovulation in ewes by these hormones is presented.

The inheritance of prolificacy in swine, H. A. STEWART. (Minn. Expt. Sta. and U. S. D. A.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 359-366).—Heritability of litter size in swine was estimated by three methods for total pigs farrowed and pigs farrowed alive. These estimates were based on records of swine raised in the swine breeding project in cooperation with the U. S. D. A. Regional Swine Breeding Laboratory from 1937 to 1943, inclusive. The management of the herds was previously described (E. S. R., 94, p. 48). Estimates of heritability of litter size were obtained from (1) correlation between paternal half sibs, (2) correlation between full sibs, and (3) intra-sire regression of the litter size of daughters on that of dams. Only first litters were considered in each of the three methods. All the estimates fell within the range of 8.8 to 17.6 percent, with the mean 13.6 percent from live pigs farrowed and 14.5 percent from total pigs. Estimates of repeatability from the partial regression of second litter size on first litters corrected for age differences were 12.8 percent for the live pigs and 13.3 percent for the total pigs farrowed, indicating close agreement between estimates of heritability and repeatability. It is concluded that variations in litter size are largely due to the effects of genes. In this population, with an inbreeding coefficient of 0.19 percent in the ♀♀ used, the genetic variance was expected to be 19 percent less than that of an

outbred population in which the heritability of the number of pigs farrowed is estimated at approximately 17 percent. It was estimated that progress in increasing fertility by selection in an outbred stock low in fertility would be very slow if simultaneous selection for other characteristics continued. It was expected that the most rapid progress would result from a greatly increased selection differential, as might be expected from an outcross of individuals selected on the basis of fertility from a strain or line of high fertility. The most rapid progress may be expected from the development of fertile inbred lines and their dissemination throughout the breed.

The distribution of cell types in the anterior hypophysis during late pregnancy and lactation. N. B. EVERETT and B. L. BAKER (*Endocrinology*, 37 (1945), No. 2, pp. 83-88).—Differential cell counts of the hypophysis from pregnant and lactating rats showed that at 3 days' post-partum the acidophiles have increased to almost 100 percent above the number present in pregnant rats, and there was an increased granulation believed to be associated with the high lactogen content of the pituitary. Basophiles were more numerous in 10-day pregnant rats than in rats pregnant 20 days or during lactation. There was no significant change in the rat hypophysis in lactation as compared with pregnancy. A total of 42 animals during pregnancy or lactation was sacrificed for microscopic study of the cell types.

Causes of the zebra and other patterns. A. DEAKIN (*Westboro, Ont.: Author*, 1944, pp. 17, illus. 6).—Zebra patterns are largely determined by the influence of major and minor modifying genes through recombination. The pattern is one of complex spotting, the fetus being first pigmented and then the inhibitor synthesized, which splits the pattern into stripes as evidenced by the forking of the black stripes in the regions of differential body growth. The width and direction of stripes are accounted for by the time in embryonic life when the pigment and inhibitor become effective. Pattern design in other species such as the giraffe and leopard is discussed.

Seasonal variation of rabbits to pituitary extracts. G. McCORMACK and C. A. ELDEN (*Endocrinology*, 37 (1945), No. 4, pp. 297-299, illus. 1).—A definite seasonal variation was found in the sensitivity of rabbits to powdered pituitary extracts. In agreement with the findings of R. T. Hill, the pituitary from ♀ was more potent than that from ♂♂. The gonadotropic potency of sow pituitary was stronger than that from sheep.

The ovarian interstitial gland tissue and its relation to the pregnancy cycle in the guinea pig. W. T. STAFFORD and H. W. MOSSMAN. (Univ. Wis.). (*Anat. Rec.*, 93 (1945), No. 1, pp. 97-107, illus. 13).—Histological study of the ovary of the guinea pig showed that usually the interstitial gland cells and their arrangement indicate that they are formed from the theca interna of degenerating follicles, and that those of the medulla are the result of migration of the cortical masses toward the center of the ovary. The cells were generally more scattered in the medulla and larger and often more heavily laden with osmiophilic granules. There was no easily observable cycle in character or amount of interstitial gland tissue in the guinea pig ovary that could be correlated with the pregnancy cycle. There was a trend toward a maximum relative amount of interstitial gland tissue in the cortex near estrum and through early pregnancy, with a minimum in midpregnancy. The peak and low of the medulla seemed to lag a week or so behind that of the cortex. These results are in agreement with findings in other animals. Evidently the interstitial glands revert to the fibroblasts. Photomicrographs of ovaries are presented.

The effects of the major genes controlling coat color in the guinea pig on the dopa oxidase activity of skin extracts. B. GINSBURG (*Genetics*, 29 (1944), No. 2, pp. 176-198, illus. 8).—An enzyme behaving like a polyphenol oxidase was extracted

from the skin of certain genotypes, but its activity was destroyed by boiling. The auto-oxidation of dopa can be completely inhibited by the substance extracted from guinea pig skins, which is limited to the epidermis and is not in dermis extracts. The inhibitor is not found in the albumin fraction of the extract, nor is there any evidence that it is affected by any of the known color genes. The enzyme reaction is related to the phenotypes and is probably concerned with the formation of yellow pigment. Its concretion is diminished by those genes normally reducing the intensity of yellow and is not affected by those reducing only the intensity of brown, sepia, or black. Although it is present in the skins of such guinea pigs, it is not the critical factor in determining the kind of pigment actually produced when *E-* is present. This enzyme affected only quantitative variations. Enzyme reaction was related to genotype. Replacements at the *P. B.* and *A* loci are not paralleled by changes in the dopa reaction. Also replacement of *E-* by *e^pe^p* has little effect in black or brown areas of tortoise shell animals. The concentration of the enzyme is drastically reduced by the replacement of *FF* by *ff*. *Ff* is intermediate, as *F* is an imperfect dominant. The replacement of *C* by *c^s* or *c^e* caused a dilution of these genes on yellow coat color, but there is no activity whatever in extracts from animals in which *C* is replaced by *c^r* or *c^e* (that is, if yellow pigmentation is eliminated) or with those prepared from the white areas of spotted (*ss*) animals. The genotype distribution of the enzyme agrees with that of the active principle demonstrated in pigment cells of the hair follicles, by W. L. Russell (E. S. R., 83, p. 180), but does not agree with the active principle demonstrated by E. S. Russell (E. S. R., 82, p. 611). The spectra of the artificial dopa melanins is discussed. An excellent bibliography on the dopa reaction is given.

The development of the guinea pig ovary from sexual differentiation to maturity, C. G. BOOKHOUT (*Jour. Morphol.*, 77 (1945), No. 2, pp. 233-263, illus. 24).

Development of the golden hamster, *Cricetus auratus* Waterhouse, during the first nine days, A. P. GRAVES (*Amer. Jour. Anat.*, 77 (1945), No. 2, pp. 219-251, illus. 30).—Descriptions of the early developmental stages of the golden hamster are given from 178 embryos preserved at close intervals up to 8½ days. The hamster is the fastest developing mammal known, and is remarkable for precocity of reproduction in the ♀. The eggs are relatively large and contain large amounts of formed yolk. The general course of development is compared with that of the opossum and the rat.

On the factors involved in sperm transport through the cervix uteri of the albino rat, R. J. BLANDAU (*Amer. Jour. Anat.*, 77 (1945), No. 2, pp. 253-272, illus. 1).—In a study of 205 mature ♂ and ♀ albino rats, the cyclic changes in the tonicity of the cervix in relation to the onset of sexual receptivity, the role of the copulation plug in effecting insemination, and the factors operating at the moment of ejaculation as related to the ingress of spermatozoa into the cornua were investigated. During diestrus there was a low tonus of the cervix. The cervix was sufficiently contracted to retain fluid enough to distend considerably the cornua 4.3 hr. before the onset of heat. The high tonus is maintained after the beginning of heat for an average of 85 hr. The average length of the period of cervical contraction was 12.8 hr. The cervical muscles begin to lose their high tonicity approximately 4 hr. before the end of sexual receptivity. Spermatozoa ejaculated into the vagina of ♀♀ in heat by ♂♂ whose vesicular and coagulating glands were ligated did not penetrate through the contracted cervix. Copulation plugs of only small size were formed by such ♂♂, but the small plugs were effective in causing the ingress of spermatozoa into the cornua. When a copulation plug was not formed, the cervical tonicity of ♀♀ in heat was not lower. Evidence indicates that the formation of copulation plug plays a vital part in the normal transport of the spermatozoa through the cervix. The ♂ glans and prepuce and

the lappets of the vaginal portion of the cervix in the ♀ play important parts in the passage of spermatozoa into the cervix. The ♀ orgasm seems important in the ingress of spermatozoa into the cornua.

The first maturation division of the rat ovum, R. J. BLANDAU (*Anat. Rec.*, 92 (1945), No. 4, pp. 449-457, illus. 12).—Photomicrographs and descriptions of a series of selected sections, including most or all of the first polar bodies of rat ova, are presented.

Effects of thyroid feeding on ovarian development in the rat, B. H. ERSHOFF (*Endocrinology*, 37 (1945), No. 3, pp. 218-220).—A marked deficiency of the ovaries was noted in ♀ rats receiving 0, 0.5, and 1 percent of desiccated thyroid per day for 60 days. A marked inhibition of the ovarian development occurred in gross and histological ovarian tissues in thyroid-fed rats. There were no significant differences in the ovaries of rats receiving 0.5 and 1 percent levels of the thyroid.

A study of hyaluronidase-effects on the follicle cells of ovulated rat ova, S. L. LEONARD and R. KURZROK. (Cornell Univ.). (*Endocrinology*, 37 (1945), No. 3, pp. 171-176, illus. 2).—The discovery of the dispersion of follicle cells surrounding recently ovulated mammalian ova by the enzyme hyaluronidase prepared from mammalian testis was confirmed. Follicle cells of ova of rats immunized against bull testis extracts (containing hyaluronidase) were dispersed as readily as those from normal rats. Normal undiluted rat serum inhibited the action of the enzyme on the follicle cells in vitro, but sufficiently diluted serum did not inhibit the reaction nor did normal rat serum at the same dilution. The relation to sterility and artificial insemination is discussed.

Bisexual mating behavior in the male rat: Effects of castration and hormone administration, F. A. BEACH (*Physiol. Zool.*, 18 (1945), No. 4, pp. 390-402).

The day to day level of estrogen and progesterin throughout pregnancy and pseudopregnancy in the mouse, W. B. ATKINSON and C. W. HOOKER (*Anat. Rec.*, 93 (1945), No. 1, pp. 75-95, illus. 19).—Histological features induced in the endometrium of the ovariectomized mouse by injected estrogen and progesterone were used to indicate by comparison the levels of these hormones secreted through pseudopregnancy and pregnancy. Ligation of one uterine tube in pregnancy limited the effects of conception products to the other uterine horn. There were low levels of estrogen and progesterin on the first day of pseudopregnancy, but the level of progesterin rose progressively for 3 days and remained high for the next 4 days. After the ninth day there was a progressive decrease in the progesterin to a low level on the twelfth day. On the other hand the level of estrogen declined during the first 3 days and was absent during the next 5 days. A high level of estrogen abruptly reappeared on the tenth day and then declined. The history during the first part of pregnancy was essentially the same as in pseudopregnancy. The level of progesterin decreased sharply on the ninth day of pregnancy and remained low throughout the rest of gestation, except the suggestion of a slight increase during the last 4 days. Estrogen remained low until the eleventh day, after which it remained at a moderate level until just before parturition, when it increased. The action of estrogen virtually disappeared by 2 days after parturition, whereas progesterin attained a high level. A rather extensive list of references is cited.

Differentiation of prospective limb material from creeper chick embryos in coelomic grafts, D. RUDNICK. ([Conn.] Storrs Expt. Sta. et al.). (*Jour. Expt. Zool.*, 100 (1945), No. 1, pp. 1-17, illus. 13).—Continuing the study of limb formation in creeper fowls by Landauer (E. S. R., 92, p. 500), examination of the limb-forming regions of chick embryos 6-19 somites of age from a creeper × creeper mating, grown in normal hosts for 6-14 days, showed that 15 of 21 donors of which one or both sides developed into classifiable limb grafts belong either to the ++ or the Cp+ group and that the remaining 6 donors furnished unmistakable phokomelic limbs.

The striking anomaly was implicit in the limb-forming area of the blastoderm as early as the 6-9 somite stage, hence probably as early as the limb field is capable of differentiation when transplanted. Few developed strikingly bent long bones, although 4 of the 15 formed very normal appearing limbs.

Recessive rumplessness of fowl with kyphoscoliosis and supernumerary ribs, W. LANDAUER. ([Conn.] Storrs Expt. Sta.). (*Genetics*, 30 (1945), No. 5, pp. 403-428, *illus.* 11).—A skeletal mutation in the fowl is described which leads from the intermediate type of rumplessness by imperceptible steps from complete rumplessness to entirely normal tail. This mutation resembles closely the forms of expression of the dominant rumpless mutation and its modifications (E. S. R., 89, p. 532). The morphological traits which distinguish this character from dominant rumplessness are that the rudimentary caudal vertebrae frequently have the appearance of lateral compression and show marked lordosis. There is frequently a synsacral kyphoscoliosis of varying degree, with a compensatory thoracic or synsacrothoracic scoliosis in the opposite direction. The pelvic bones of such animals were deformed. The acetabula stand at different levels, and asymmetry of locomotion is obtained by coxa vara of the femur with the lower articulation. A less common part of the syndrome is the occurrence of supernumerary ribs, which may be unilateral or bilateral, rudimentary, or fully formed. There is more frequent and more severe expression in ♂♂ than in ♀♀. This syndrome is completely recessive to the normal. The mutation was found in White Leghorn stock, but its expression was subject to the action of autosomal and sex-linked modifying genes. Completely rumpless embryos have a slightly reduced chance of hatching, but there is no marked effect on the embryo survival. During postnatal growth there was some increased mortality of chicks with abnormal caudal vertebrae as compared with their sibs with normal tail vertebrae. The ash and calcium content of the pelvic bones of all rumpless stock is reduced as compared with normals, even though some of the genetic rumpless birds had normal tails. The percentage of water in these bones was increased at the expense of organic material. Hydration is found in the femur and tibia of rumpless and intermediate birds from recessive rumpless stock, but not in those that had a normal caudal skeleton. Differences in the chemical composition were not revealed by chemical analysis of the skeleton, but alizarin staining demonstrated delayed calcification in the synsacral vertebrae, the pelvis, and the uncinat processes of the ribs. There were no signs of rickets, but there were changes in the composition of the axial skeleton which probably accounted for the reduced mechanical strength, resulting in kyphoscoliosis. There is evidence that the modifiers of rumplessness are genes which serve as stabilizers of normal development of the caudal skeleton.

Experimental alteration of growth rate in chimaeric feathers of breast-saddle origin in the Brown Leghorn capon, H. WANG (*Physiol. Zool.*, 18 (1945), No. 4, pp. 335-364, *illus.* 4).—Analyses were made of the growth rates of over 300 chimaeric feathers from the breast and saddle composite papillae experimentally produced in Brown Leghorn capons by different methods of grafting, with reference to the normal rates of growth of these components. These methods include combinations of heterologous sagittal and frontal halves, reciprocal addition of papilla sectors, grafting of intact or hashed saddle papillae to breast, and combinations of ventral halves of breast and saddle papillae. Representative feathers were measured throughout their regeneration with unoperated follicles as controls. The transverse chimaerae are of special significance because they strongly suggest that, while the middle transitional zone grows at a reduced rate, the saddle apex and the breast manifest, unmodified, their respective normal rates of growth. Computed growth rate and length of experimental feathers "showed consistently that whenever morphological features indicated a successful incorporation of a saddle graft in a breast

papilla, the growth rate of the feather was reduced, with a concurrent increase in both the regeneration time and the total feather length attained. No such effect was observed in cases in which similar grafts failed to survive or persist, or when breast papillae received homologous grafts; nor did comparable breast grafts to saddle papillae reveal any trace of a reciprocal effect. These results are, therefore, considered as highly suggestive of a unilateral action of the saddle epidermis on that of the breast." A theoretical discussion of the interrelationships between the growth rate of chimaeric feathers, regeneration time, and length of the feathers is included. An extensive list of references is also presented.

Mating behavior and the social hierarchy in small flocks of White Leghorns, A. M. GUHL, N. E. COLLIAS, and W. C. ALLEE (*Physiol. Zool.*, 18 (1945), No. 4, pp. 365-390).—Detailed observations were made on approximately 1,630 treadings, with an extensive list of citations to the literature.

The lymphatic system of the domestic fowl, J. W. DRANSFIELD (*Vet. Jour.*, 101 (1945), No. 8, pp. 171-179, illus. 10).—The lymphatic system of the fowl is described and diagramed, using the terminology of Kaupp (*E. S. R.*, 40, p. 483).

A triple-allele series and plumage color in turkeys, V. S. ASMUNDSON. (Univ. Calif.). (*Genetics*, 30 (1945), No. 4, pp. 305-322, illus. 1).—With the triple allelic genes *B* (Black), *b* (Bronze), and *b*¹ (Black-winged bronze) reported in this paper, the number of mutant genes known to influence plumage color in the turkey was increased to nine. Of these, six were autosomal and three sex-linked. White (*cc*) birds of the constitution *BB*, *Bb*, *Bb*¹, or *b*¹*b*¹ have white down free of buff pigment found in *bb* or *bb*¹ whites. Matings of different strains of whites gave ratios of white to buff down conforming to expectation. The dominance of *D* (slate) over *d* (nonslate) was confirmed. The *B* and *D* genes were not linked. The gene *sl* (slate) was a simple recessive to nonslate (*Sl*). *R* and *Sl* were not linked, but *B* and *Sl* may be linked, although critical evidence was lacking. *B* and *R* were not linked. A simple autosomal gene, palm (*p*), was recessive to nonpalm (*P*) and was at a different locus than the triple alleles. Brown was sex-linked and recessive. The six autosomal genes (*B*, *b*¹, *p*, *r*, *D*, and *sl*) were known to influence plumage color. There were also three sex-linked genes (*n*, *al*, and *e*) which influenced plumage color. The intensity of red pigmentation in the plumage was reduced by the pattern genes (*B*, *b*¹, *p*, and *n*). The triple allelic series produced more uniformly slate birds than the *b* gene. Several papers are cited on inheritance of color in turkeys.

A race of hermaphrodite-producing pigeons, O. RIDDLE, W. F. HOLLANDER, and J. P. SCHOOLEY (*Anat. Rec.*, 92 (1945), No. 4, pp. 401-423, illus. 17).—A case of true hermaphroditism in race 267 and the perpetuation of this condition by crossing a sister of the hermaphrodite and a Tippler pigeon was noted in more than eight generations. The progeny consisted of normal ♀♀, normal ♂♂, ♂♂ with oviducts which varied from fragments to nearly 1 percent of the body weight (pseudohermaphrodites), and birds with right testes and left ovotestes and complete oviducts (true hermaphrodites). Both types of hermaphrodites were shown to be modified genetic ♂♂, and most true hermaphrodites are fertile when bred as ♂♂. ♂♂ of race 267 were characterized by an unusually small testis and those of the Tippler race by a regularly shaped testis. Both races evidently contributed something that favors the frequent appearance of the trait in the offspring. Unequal types and numbers of sexually modified offspring were produced in reciprocal outcrosses of ♂♂ and ♀♀ to normal races. It appears that one or more genetic factors, together with a maternal nongenetic influence, is involved in the intersexuality of some of the ♂ offspring. The nongenetic influence is tentatively identified as a production of unusual quantities of estrogen which, after inclusion in the

eggs, causes an increase and persistence of ovarian cortex on embryonic left testes, as observed by Riddle and Dunham (E. S. R., 88, p. 40).

Intersexuality in male embryos of pigeons, E. L. LAHR and O. RIDDLE (*Anat. Rec.*, 92 (1945), No. 4, pp. 425-431, illus. 8).—Histological study showed that as the pigeon embryo develops there is a temporary development of ovarian cortical tissue on the surface of the left testis. In 33 cases from normal races of pigeons, this ovarian tissue degenerated between the fourteenth day of incubation and the end of the incubation period (18 days). In such testes the ovarian tissue disappeared completely at or before the time of hatching. The testes from the hermaphrodite strain (28 cases) in the above experiment differed from those of the normal type by showing a delay in the time at which atrophy of the cortical tissue begins. The atrophy was first observed in two of seven cases examined on day 17. The tissue had disappeared in only one of four embryos at day 18 and in only three of six embryos examined 5 days after hatching. Birds which retain large amounts of ovarian tissue at and after hatching are presumably the ones to possess a left ovotestis and a left oviduct in adult life. Reference is made to the probable role of estrogen in the development and variable persistence of ovarian tissue on the left testes of pigeons.

Suggestive evidence for duplicate genes in a species hybrid in doves, M. R. IRWIN and R. W. CUMLEY. (Univ. Wis.). (*Genetics*, 30 (1945), No. 4, pp. 363-375).—The hybrid substance of species hybrids between Pearlneck and ringdove has been divided into three components by agglutination absorption with the cells of various backcross hybrids. One fraction is always associated with the *d*-4 antigenic character of Pearlneck and another with *d*-11. Another fraction was linked, but not completely, with each of several antigens of Pearlneck. It consisted of one substance or a group of closely related substances regardless of association with different antigens of Pearlneck. The latter was genetically and immunologically independent. Thus genes with duplicate effects in interaction are located on several chromosomes of Pearlneck. Another possible but less probable explanation is that the third factor was produced by a gene or genes on but one chromosome of Pearlneck interacting in the species hybrids, with one or more genes from the ringdove and the seeming association with various antigens specific to Pearlneck. This association between the antigens specific to Pearlneck and ringdove was one of chance.

On partial melanism associated with parathyroid enlargement in pigeons, W. F. HOLLANDER and O. RIDDLE (*Amer. Nat.*, 79 (1945), No. 784, pp. 456-463, illus. 1).—Nongenetic partial melanism was observed in five adult ♀ domestic pigeons and one similar case in an old ♂ hybrid after it became unable to fly. Slight exposure to sunlight and enlargement of the parathyroids were associated with all of these cases. The conditions are thought to have been responsible for previously reported instances of melanism in caged wild birds. In two instances plucked melanistic feathers were replaced by normal ones when a concentrate of cod-liver oil was administered. Parathyroid enlargements occurred regularly in young pigeons reared on a mixed grain ration in the absence of direct sunlight. Defective ossification occurred.

FIELD CROPS

Advances in grassland husbandry and fodder production. (*Imp. Bur. Pastures and Forage Crops [Aberystwyth]*, Bul. 32 (1944), pp. 108, illus. 3).—Problems of grassland management and fodder production in different parts of the world are considered in articles and reviews (several with bibliographies) entitled: Towards

A National Pastoral Policy [in the Union of South Africa], by D. Meredith (pp. 5-22); Field Experiments at Potchefstroom, by M. Hall (pp. 23-28); Pasture Development and the Dairy Industry in New Zealand, by W. M. Hamilton (pp. 29-46); Trials of Herbage Plants at Lincoln, New Zealand, by R. O. Whyte (pp. 47-49); The Herbage Seed Position in the United States of America, by D. Brown (pp. 50-60); Regrassing in the Canadian Prairies (pp. 61-65), and Hill Sheep Farming in Great Britain (pp. 65-69), both by R. O. Whyte; The Scientific Work of R. D. Williams, by T. J. Jenkin (pp. 69-73); Irrigation of Lucerne in U. S. S. R., by S. K. Kondrašev, trans. by R. P. Jones (pp. 74-87); Fodder Trees in Madras (pp. 88-93), and Oil of *Trifolium subterraneum* (pp. 93-94), both by M. Hall; Herbage in the Control of Erosion (pp. 94-97), and Vegetation and Erosion in Misiones, Argentina (pp. 97-106), both by G. M. Roseveare; and The Agriculture of Szechwan, by R. O. Whyte (pp. 106-108).

The provision of animal fodder in tropical and subtropical countries, I (*Imp. Bur. Pastures and Forage Crops* [Aberystwyth], *Bul. 31* (1944), pp. 84, illus. 5).—Problems experienced in forage production from natural grasslands or cultivated crops in the Tropics under both moist and semiarid conditions, and the extent to which these are comparable to the problems of temperate lands, are treated in a series of contributions entitled: Grassland Management in the West Indies, by D. D. Paterson (pp. 7-29); Hawaii—Vegetation Zones, by A. R. Beddows (pp. 30-35) (*E. S. R.*, 89, p. 437); Hawaii—Research on Fodder Production, by R. O. Whyte (pp. 36-43); Fiji—Pasture Types and Management, by C. R. Turbet (pp. 44-48); Gold Coast—Agricultural Progress, by H. B. Waters (pp. 49-50); Gold Coast—Grass in the Economy of the Northern Territories, by C. W. Lynn (pp. 50-54); Gold Coast—Observations of the Veterinary Services, by J. L. Stewart (p. 55); Nigeria—Grass Farming and Grassland Improvement (pp. 56-60), Anglo-Egyptian Sudan—Grassland Regions and Forage Production (pp. 61-63), and Zanzibar—Grassland Types and Forage Production (pp. 64-67), all by S. D. Ross and E. D. Bumpus; Southern Rhodesia—Grassland Management and Research, by A. E. Romyn, A. D. Husband, and S. D. Timson (pp. 68-78); and Southern Rhodesia—Trials With Indigenous and Introduced Grass, by H. C. Arnold (pp. 78-82).

Drought resistance in range and pasture grasses, O. JULANDER. (*Iowa Expt. Sta.*). (*Plant Physiol.*, 20 (1945), No. 4, pp. 573-599, illus. 8).—Buffalo grass and Bermuda grass were found most resistant to heat, bluestem was intermediate, and slender wheat, smooth brome, and Kentucky bluegrass were low in resistance. All species tested when low in food reserves and unhardened were very susceptible to exposures of 48° C. (118.4° F.). Heat resistance rose with an increase in food reserves. Heat resistance was shown to be a measure of drought resistance, for the ability of these species to resist heat corresponds closely with the aridity of their natural habitats. Drought-hardened plants were much higher in food reserves than unhardened plants and were more resistant to heat injury in all comparisons. Detrimental effects of clipping on heat resistance proved highly significant when the data on all species were pooled. Bermuda grass, buffalo grasses, and bluegrass, however, were much more resistant to clipping than other species. These grasses by stooling out near the ground could maintain enough foliage, even under moderately heavy clipping, to provide reserve accumulations for drought hardening. Heavy grazing of bluegrass resulted in a decrease in heat resistance.

Protected or moderately grazed grasses accumulated excess food reserves as they entered drought, large accumulation of colloidal carbohydrates, especially levulose, being associated with drought resistance. Over-grazed and heavily clipped plants did not accumulate food reserves during drought and were less resistant. Sucrose accumulations were found whenever large supplies of colloidal carbohydrates were present, but reducing sugars did not accumulate during drought.

Further adjustments in range management to provide proper utilization standards for important forage plants at the beginning of the usual dry season are suggested from results of these studies in Utah and New Mexico. Such practice would provide for hardened plants capable of withstanding drought, adequate food reserves for respiration and for vigorous recovery after drought, and reduction in drought conditions by a protective vegetative cover which guards against high soil temperatures and water loss.

Mechanical treatments for increasing the grazing capacity of shortgrass range, O. K. BARNES and A. L. NELSON. (Coop. U. S. D. A.). (*Wyoming Sta. Bul.* 273 (1945), pp. 35, illus. 9).—Treatment of short grass range, typical of the Great Plains, with the eccentric one-way disk, groover, 8-in. moldboard plow, and killifer subsoiler at several spacings was studied 1939–43 near Archer, Wyo., as to effects on forage production, grazing capacity, and vegetation density and composition. Of the treatments significantly increasing forage production on the range, the eccentric one-way disk used to pit the range appears to be outstanding in ease of application and effectiveness. Closely spaced treatments were the only types with influence on production and composition of the vegetation.

A pasture on land pitted with the eccentric disk and another grooved at 2-ft. intervals in 1939 showed a 4-yr. average of 11 percent greater grazing capacity and 6 lb. more lamb gain per acre than nontreated range, and also a greater volume of perennial grass at the end of the grazing season. In the fourth year the treated pastures carried 36 percent more sheep per acre and more grass was left at the end of the season. Pitting and grooving at 2-ft. intervals did not differ significantly in effects on the vegetation and production.

Pastures pitted with the eccentric disk in April 1942 carried an average of 13 percent more sheep per acre for the first 2 yr., and the lamb gain per acre was 25 percent greater on the pitted range. Even though stocked heavier, the pitted pastures averaged more perennial grass left at the end of the grazing season than did nontreated pastures.

In a series of small plats comparing a plow, a groover, and killifer with furrows at 5, 10, 20, and 30 ft. intervals, the 5-ft. interval with both plow and groover was the only spacing significantly increasing forage production 1939–43. The killifer failed to increase production at any furrow interval. In general, on short grass range any treatment that is spaced wider than 4 to 5 ft. will not have a striking influence on the over-all vegetative composition. Early spring, before much plant growth starts, appears to be the best time to apply these treatments to the range.

The effect of the closely spaced type of mechanical treatment on the range cover apparently has been a general stimulation of the vegetation. Thinning the cover has apparently made more moisture and plant food available per remaining plant and these plants have equaled or exceeded in most instances the production on nontreated range. An increase in western wheatgrass and other desirable species has resulted at the expense of the blue grama grass. Increase of these species has raised the total forage production, increased the feed available in the early spring period, improved the ability of the range to hold and retain moisture, and improved the quality of the range feed through the greater volume of a variety of grass species. The pits and grooves have also served to retain excess precipitation.

Applications of these treatments to range that already supports a midgrass type of vegetation, as often occurs on slopes in the region, have had little influence on the composition of the original cover. However, the renovating effect of tillage, the thinning, and the presence of the pits, grooves, or other types of structure for holding water have increased the species production even of this vegetative type.

Carotene content of native Nebraska grasses, I. L. HATHAWAY, H. P. DAVIS, and F. D. KEIM (*Nebraska Sta. Res. Bul.* 140 (1945), pp. 15, illus. 3).—The carotene

content of 24 grasses native to Nebraska, determined at about monthly intervals from June to November, was moderately high in most of the grasses during the growing season, but declined to a rather low point by late November. All of the grasses with the exception of switchgrass, hairy grama, little bluestem, and prairie dropseed contained enough carotene to supply the needs of range cattle until late November. Only 18 of the grasses still contained enough carotene by the latter part of September to furnish that required by dairy cows, and even as early as July the northern reedgrass, buffalo grass, bluejoint and lovegrass were unsatisfactory sources. Carotene values observed during the periods of greatest concentration varied from 511.6 p. p. m. (sandhill bluestem) to 122.6 p. p. m. (northern reedgrass), and from 60.7 p. p. m. (June grass) to 1.6 p. p. m. (little bluestem) during periods of lowest concentration.

Report of experiences and research with fine turf for 1943, H. L. LANTZ. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.] 78 (1943), pp. 215-218*).—Trials of bentgrass strains, control of brown patch, and the merits of new bentgrasses and their value to Iowa are discussed from results of current station research.

Legume inoculation, F. B. SMITH, R. E. BLASER, and G. D. THORNTON (*Florida Sta. Bul. 417 (1945), pp. 32, illus. 9*).—Field and greenhouse experiments concerned with the effects of soil reaction, lime, and fertilizers, the efficiency of cultures, and various seed treatments on the inoculation of 10 clovers and 3 lespedezas were conducted on 9 different soil types, 1939-45. Growth and yield of clovers were associated with good inoculation. The lime requirements of species of *Medicago-Melilotus* was higher than that of the *Trifoliums*. The limiting pH for the successful inoculation of species of *Medicago-Melilotus* was 6.3 and for the *Trifoliums* 5.2. The lime required also varied with soil type. Rock phosphate produced satisfactory nodulation of some of the *Trifoliums* on certain soil types, but rock phosphate and calcium carbonate gave superior results for all clovers, and rock phosphate could not be substituted successfully for limestone. Supplemental seed treatment to enhance nodulation gave contradictory results and was generally without significant effects. Use of larger quantities of inoculum than recommended by the producers of commercial cultures gave significantly increased nodulation of clovers. Efficiency of cultures was found to vary markedly. Bacteria isolated from clovers grown in Florida were superior to those isolated from clovers grown elsewhere. Efficiency of the station cultures was generally increased by processing.

Grain storage studies, I, II, M. MILNER and W. F. GEDDES. (Minn. Expt. Sta.). (*Cereal Chem., 22 (1945), No. 6, pp. 477-501, illus. 7*).

I. Influence of localized heating of soybeans on interseed air movements (pp. 477-483).—The changes in interseed air composition and temperature of soybeans (E. S. R., 88, p. 431) stored throughout a winter season in a large open-top commercial bin were followed at many points in the bulk by a series of preinstalled small diameter pipes. Heating, which began in a zone of high moisture, led to considerable air movement in the stored soybeans, as indicated by appreciably higher CO₂ values in the upper and cooler portions of the bulk than in, or below, the zone of heating.

II. The effect of aeration, temperature, and time on the respiration of soybeans containing excessive moisture (pp. 484-501).—The influence of time, aeration, and temperature on respiration of Wisconsin Manchu soybeans containing about 18.5 percent moisture was studied by a technic providing for simultaneous measurement of O consumption and CO₂ production under conditions of continuous and controlled aeration. Respiration-time studies conducted up to 3 weeks yielded curves similar to microbiological population growth curves in form. Aeration rate influenced respiratory activity markedly when insufficient to maintain concentrations of CO₂ in the interseed air below about 12 to 14 percent. Respiration under N remained

constant with time at a rate of about 3 percent of that under optimum aeration. In temperature studies at 25° to 45° C. in increments of 5°, maximum respiratory activity was shown at 40°. Inhibition of respiration was very marked at 50°. The temperature coefficient increased with aeration until optimum aeration was attained. Thermal killing of seeds at 50°, which permitted survival of mold spores, increased markedly subsequent respiration at 30° above that of the combined viable seed and indigenous mold respiration at the optimum of 40°.

Respiratory quotients of 1.0, exhibited under optimum aeration conditions, appeared to be characteristic of mold (*Aspergillus* spp.) respiration. Indirect evidence indicated that the respiratory quotient of dormant soybean seed respiration is below 0.85. Mold proliferation, as indicated by appearance of the seed, was correlated positively with respiratory activity (and thus with degree of aeration up to the optimum) and with increases in temperature to 40°. Acid value of the oil extracted from soybeans at the end of respiration trials increased with aeration, with respiratory activity, and with mold proliferation. Only slight increases with time appeared in samples respiring under N.

Tropical kudzu, E. A. TELFORD and N. F. CHILDERS (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 11, pp. 210-211, illus. 1).—Tropical kudzu (*Pueraria phaseoloides*) is relatively resistant to drought; grows well in full sun and beneath trees of moderate shade; has no serious insects or diseases; makes good pasture for dairy cows in Puerto Rico; and produces abundant seed, from which it is easily established. While the legume tends to spread from an original planting when seeding is permitted, it may be destroyed easily by plowing. It covers the ground thoroughly and quickly from seed, thus helping to control hillside and gully erosion and at the same time adding organic matter and nitrogen to the soil. Comments are also made on its soil and cultural uses, ability to compete with vigorous grasses, value in mixture with malojillo grass (*Panicum purpurascens*), and feed value.

Fiber from the stems of common and swamp milkweeds, E. G. NELSON and S. T. DEXTER (Coop. U. S. D. A.). (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 1, pp. 20-26, illus. 3).—Stems of common milkweed (*Asclepias syriaca*) and swamp milkweed (*A. incarnata*) harvested in 1943 near Petoskey were retted, and the fiber extracted and compared with that of flax and hemp. As an average for the season, about 1 man-hour of labor was required to cut, bundle, and tie 5 lb. of milkweed stems, dry weight basis. This harvest labor requirement would make collection of wild stands unprofitable by methods followed. Fiber was separated from stems of upland milkweed with difficulty, because both fiber and stems broke to short fragments without satisfactory separation, and the quantity and quality of line fiber were poor. The fiber separated more readily from swamp milkweed, which produced more line fiber, but the quantity was low compared with flax or hemp. Compared with an average grade of flax fiber, swamp milkweed fiber was slightly more than half as strong and fiber of upland milkweed less than half as strong. Lots of fiber were judged unsatisfactory in spinning value by manufacturers, the greatest objections being the lack of cleanness and uniformity and the adhering stem tissues which resulted in a ribbon-like condition of the fiber. The upland milkweed stems, which are the only ones that would be available in quantity, produced only a poor quality of tow.

Results of the experiments are generally in accord with previous findings of other investigators. There seemed to be no advantage to Michigan agriculture in attempting to gather and use milkweed fiber. In Michigan both flax and hemp produce fiber of better quality and in greater yield per acre with much lower costs.

Germination tests and field results, M. T. MUNN. (*N. Y. State Expt. Sta.*). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, p. 15).—Oats of 36 typical stocks planted May 26 with soil temperatures at the seed line averaging

60° F. (46°–76°) for the 10 days of emergence germinated 75 percent, while those planted June 5 with 73° (62°–83°) average seed line temperature germinated slightly below 50 percent. Differences in temperature with resultant differences in stand are discussed with particular reference to germination of immature stocks of seed oats.

Clinton oats arrive, H. C. MURPHY and L. C. BURNETT. (Iowa Expt. Sta. coop. U. S. D. A.) (*Farm Sci. Rptr. [Iowa State Col.]*, 6 1945), No. 4, pp. 3–7, illus. 5).—Clinton oats, originated at the Iowa Experiment Station as a selection from D69 (Richland × Green Russian) × Bond, was to be available for farmers in Iowa, Illinois, and Indiana in 1946. It is a medium tall yellow, early oats with plump kernels, thin hulls, and a high test weight. It has a very stiff straw and can stand up on very rich soil for 10 to 14 days after ripening, which may enable this oats to be combined direct while standing in the field after drying out. Clinton has outyielded all other named varieties in comparative tests. It is resistant to races 8 and 10 and the other common races of stem rust, resistant to halo blight and to *Helminthosporium* leaf blotch, and susceptible to race 45 and to similar races of crown rust. The date ripe, height, lodging, test weight, and yield of Clinton oats compared with Tama, Boone, Gopher, and Richland in tests at Ames and Kanawha 1938–45 are tabulated.

Fertilizer placement for potatoes: A comparison of level-band and Hi-Lo methods, J. C. CAMPBELL, A. HAWKINS, B. E. BROWN, and J. A. CHUCKA. (N. J. Expt. Stas. coop. U. S. D. A. and Maine Sta.) (*Amer. Potato Jour.*, 22 (1945), No. 10, pp. 297–311, illus. 1).—Potatoes fertilized by the standard level-band method (fertilizer in a band on each side of and 2 in. from and on a level with the lower plane of the seed piece) produced the highest yields in most comparisons, 1940–42, with Irish Cobbler on Sassafras loam in New Jersey and with Green Mountain on Caribou loam in Maine; and were not consistently surpassed by potatoes treated with any of the variations of the Hi-Lo method (one band at seed piece level and the other 2 to 3 in. below, both 2 in. to the side of the seed piece). "Furthermore, in the practical evaluation of these two placement methods, it should be considered that certain mechanical difficulties are involved in any attempt to place fertilizer 2 to 3 in. below the seed-piece level. To do so requires a larger disk which is subject to breakage in rocky soil or for other causes, with consequent loss of valuable time to make replacements during the planting period. As no such difficulty is encountered in using the standard level-band method, potato growers are generally inclined to favor this particular method of fertilizer placement."

The effect of previous storage temperatures on the quality of dehydrated potatoes, R. C. WRIGHT, J. S. CALDWELL, T. M. WHITEMAN, and C. W. CULPEPPER. (U. S. D. A.) (*Amer. Potato Jour.*, 22 (1945), No. 10, pp. 311–323).—Katahdin, Sebago, and Chippewa (all Maine and Maryland grown), Bliss Triumph (Missouri), and Dakota Red (Maryland) were stored at 60°, 50°, 40°, and 32° F. When removed from storage, the sugar content of those from 60° and 50° was low, from 40° intermediate, and from 32° excessively high. When dehydrated, the highest quality was found in potatoes from 60° and 50° storage where the sugar content was low, from 40° mostly good to fair, and from 32° invariably poor to very poor. These last were sweet, soggy, and badly discolored or scorched due to caramelization of much of the excess sugar. A definite correlation existed between the quality of dehydrated potatoes and previous storage temperature of the raw stock. In general, in the early part of storage, the best quality of dehydrated material was derived from potatoes stored at either 60° or 50°. Later on sprouting occurred at 60°. In 50° storage, sprouting was hardly noticeable at the first sampling, but after 16 weeks' storage the quality in general had decreased. Little change in quality occurred in potatoes stored at 40°. A storage temperature of 60° or 50° appeared suitable or

even preferable for potato stock to be used within 8 or 10 weeks. Stock to be held much longer than this should be stored at about 40°.

Culture, fertilizer requirements, and fiber yields of ramie in the Florida everglades. J. R. NELLER (*Florida Sta. Bul.* 412 (1945), pp. 40, illus. 11).—Fertilizer experiments with ramie (*Boehmeria nivea*) on Everglades peat, 1938–42, showed that a mixture approximating a 2–6–36 formula at the rate of 500 lb. per acre annually plus minor elements (Mg, Cu, Zn, B) was needed for maintenance of vigorous growth. Plats thus fertilized produced cuttings containing spinnable fiber ranging from 2,667 to 1,777 lb. and averaging 2,140 lb. per acre per year. In large-scale mechanized operations probably only about 80 percent of this average, or 1,712 lb. of fiber per acre per year, should be anticipated because processing all of the short stems might not be possible. P and N evidently should be included in the fertilizer even though there was slight response to them during the first few years.

The cutting period extended from early May to November and December, and four cuttings a year were removed unless an unusually early frost occurred. Fiber quality was good and about the same for all cuttings except the last in each season, which was inferior if growth was unusually slow and the stems short. Amount of growth and yield of fiber were significantly higher the first 2 yr., but were maintained at a somewhat lower level the next 3 yr. The fresh green weight tonnage ranged 47 to 31 tons per year, about one-half of which consisted of leaves. The leaves are edible and average about 24 percent protein on the dry basis, and offer possibilities as a byproduct feed suitable also as a carrier for byproduct molasses. Cultural treatments to improve growth of a 7-year-old field of ramie that produced slender stems from root-bound soil resulted in some improvement, but not equal to that from a replanting of the rootstock. Growth of plants and quantity and quality of fiber were as good on Okeechobee muck as on Everglades peat.

Information is also included on a suitable type of ramie; methods of planting and applying fertilizer; increase of rootstock planting material; harvest problems; and the water control necessary for successful culture on Everglades peat and muck soils.

"These cultural and fertilizer experiments have shown that good yields of high quality ramie fiber can be produced on Everglades peat and muck soils; and in the event that the mechanical decortication of the green stems, at or near the ramie fields, proves to be successful, ramie fiber so produced and by virtue of its excellent qualities should have a fair chance of becoming a marketable product in competition with other fibers."

Growing soybeans in New Jersey. C. S. GARRISON (*New Jersey Stat. Cir.* 499 (1945), pp. 8, illus. 7).—Practical information given covers tillage and fertility needs of soybeans, planting date, rate, and methods, inoculation, varieties, weed control, harvest methods, and mixtures for hay, silage, and pasture. Varieties currently recommended are Chief and Granger for grain and Chief, Black Wilson, and Kingwa for forage and pasture.

Generalized factors for computing varietal yields of sugar from results of field tests with sugarcane. G. ARCENEAUX. (U. S. D. A.). (*Sugar Bul.*, 23 (1945), No. 21, pp. 186–191).—Tests 1932–44 indicated that varietal differences in milling qualities, unless under experimental control, may be an important source of systematic error in calculation of theoretical yields of sugar from sugarcane. For convenience, the combined effect of differences in milling qualities is resolved to a single numerical value designated as the varietal correction factor. For any given variety in comparison with a control, such a factor will closely approximate a constant. With Co. 281 as control, correction factors for varieties tested have ranged from 0.925 to 1.067. Application of the Winter-Carp-Geerlings formula to juice analyses may be simplified to the operation: $S' = (sx) - (By)$, in which S' equals pounds of 96° sugar per ton of cane, s value for sucrose percent crusher juice, x a calculated factor, B Brix

of crusher juice, and y a calculated factor. Use of x and y factors approximately adjusted for varietal differences in milling qualities reduces the determination of unbiased values for indicated yield of sugar per ton of cane from results of crusher juice analyses to a very simple operation. Evidence of differences in capacity for retention of juice by bagasse as observed between different varieties and between different levels of fiber content within the same variety detracts from the value of fiber content of cane as a criterion of presumed extraction.

Germination studies of sweet clover seed, J. M. MARTIN (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 4, pp. 289-300, illus. 1).—Hard seeds of sweetclover in natural field seedings and in seed stored over winter in unheated open buildings were found to soften usually 80 to 100 percent by April 15. Practically all of the opening of seed coats to absorption of water, however, occurred from about March 20 to April 20 at the Iowa Station. Hard seeds, wet and dry, opened equally well under the atmospheric fluctuations. Stored under constant temperatures around freezing for several months, hard seeds softened to a maximum of 24 percent, but when stored at 10° C. (constant) and in fluctuating 15°–30° there was not much softening. Hard seeds in prolonged storage in the laboratory where temperature fluctuated from 15° to 35° softened very little. Exposure of 2 mo. or longer to fluctuations around freezing was needed to soften the seeds effectively. Hard seeds buried in soil at depths of 1, 3, 6, 9, and 30 in. from October until late April varied in softening somewhat inversely with depth to 9 in. Large percentages of those buried 1 and 3 in. germinated in situ, whereas those softened at lower depths did not germinate until brought to the surface. Those at the 30-in. depth were not changed in hardness.

Looking ahead to chemical control of common weeds on golf courses, A. L. BAKKE (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 78 (1943), pp. 218-225.)—Sprays of different chemicals are recommended for control of the several annual and perennial weeds infesting golf courses and lawns.

Inhibition of pollen production in ragweed by the use of chemical sprays, B. H. GRIGSBY (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 1, pp. 45-48).—G-412 (a stock solution of di-nitro-ortho-secondary-butyl phenol containing 4 lb. of the ammonium salt in 1 gal. of Diesel oil) in kerosene, 50 and 100 cc. per gallon, gave a complete kill of ragweed within 6 hr. Vegetative portions as well as flower spikes turned brown and pollen release was stopped. Water solutions of this material killed more slowly, and where the 50 cc. dilution was used killing was not complete. G-410 a stock solution containing 4 lb. of penta-chlor phenol in 1 gal. of diacetone alcohol, 100 cc. added to each gallon of water) gave a 75-percent kill in 12 hr., but some stems remained alive and continued growth until frost. Pollen was not again produced by these plants. Sinox (E. S. R., 83, p. 55), 15 gm. of dry chemical in 1 gal. of white kerosene, killed only the younger leaves and flower spikes. Axillary buds developed and young flower shoots were evident at time of frost. Refinery residue, at dilution of 1 to 4 (in water), gave complete killing of the weeds but was very difficult to apply and left a persistent unpleasant odor. A dilution of 1 to 9 killed 75 percent of the weeds and had similar characteristics of the 1 to 4 concentration. Kerosene killed younger leaves of ragweed and any flowers ready to open when sprayed, but the effects were temporary and plants soon recovered and continued to release pollen. While these results indicate that it is possible to stop pollen production in ragweed with chemical sprays, most of the materials in this series are more or less toxic to cultivated crops at the concentrations used. Roadsides, fallow lands, and other similar areas, however, could be treated at a very low cost and thus prevent a large amount of pollen from getting into the air.

Limited greenhouse tests, during the winter and spring of 1944-45, showed that low concentrations of 2, 4-D (E. S. R., 93, p. 285) and similar materials have a very pronounced effect on ragweed. When young ragweed plants, 6 in. tall, were sprayed,

growth of terminal buds was stopped. No further elongation occurred during the observation period of 2 mo nor were there any flower spikes evident. Leaves present at the time when sprayed remained green, and the older parts of the stem appeared normal. A concentration of 1 part 2, 4-D in 3,000 parts of water was enough to prevent the formation of pollen in ragweed.

HORTICULTURE

Fertility levels for growing of vegetable plants, E. H. BJORNSETH (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 1, pp. 27-34, illus. 8).—In order to determine the favorable fertility levels for the best growth of peppers and tomatoes and their degrees of tolerance to excesses or deficiencies of nitrate and potassium, different amounts of sodium nitrate, superphosphate, and potassium chloride were added to a sterilized loam soil with indicated nitrates, phosphorus, and potassium of 10, 1, and 6 p. p. m., respectively, and a pH of 7.0. Tomato and pepper plants were injured by excesses or deficiencies of nitrate and potassium. The tomato was, perhaps because of greater vigor, more tolerant to excesses of nitrate and potassium than was the pepper. Conversely, the pepper was more tolerant of deficiencies of nitrate and potassium.

Tomato plants suitable for setting in the field can be grown at a nitrate level varying from 25 to 50 p. p. m. and a potassium level varying from 15 to 35 p. p. m. in the soil at the time of pricking off.

Pepper plants suitable for the field can be grown at a nitrate level varying from 10 to 50 p. p. m. and a potassium level of 5 to 40 p. p. m. in the soil at the time of pricking off. It is deemed probable that a more rapid growth can be obtained by growing pepper plants at a lower level of nitrate and potassium and then supplementing with nitrate and potassium in solution later in the growing period when the needs of the plant are greater.

Injury or slow growth due to deficiencies or excesses of nitrate and potassium may probably be avoided by increasing the amount of soil in the flats and maintaining the fertility at medium level.

Effects of fertilizers, animal manures, and green manures on the yield of vegetable crops on light garden soils, L. M. WARE and W. A. JOHNSON. (*Ala. Polytech. Inst.*). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 319-322).—Experiments conducted on composted soils placed in cement bins have shown that additions of organic matter result in increased yields of vegetable crops. Lettuce, beets, and carrots were particularly sensitive to a lack of animal manures while members of the cole family were considerably more tolerant. Animal manures exerted a greater effect on vegetable yields than did green manures. Winter legumes exerted a pronounced effect on the yield of summer vegetable crops and a measurable effect on fall vegetable crops following the summer vegetables. Summer legumes exerted a pronounced effect on the yield of fall vegetables and only a limited effect on spring and summer vegetables of the succeeding year.

Seasonal variations in the mineral and vitamin content of certain green vegetable crops, E. HANSEN. (*Oreg. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 299-304, illus. 1).—Sprouting broccoli, red-leaf chard, Georgia collards, dwarf Scotch kale, and Prizehead lettuce, planted during July and August, were sampled at approximately monthly intervals from August until April. The concentration of calcium in the crops was highest in August and September, decreasing during winter and then increasing again to a lesser degree during spring. Applications of lime to the soil in December had little effect on the amount of Ca which accumulated in the plants thenceforward. Phosphorus varied less than Ca in concentration, and the values tended to be higher in winter than in fall or spring.

Ascorbic acid content varied in all crops, but no consistent trends were observed. Genetic rather than environmental factors appeared of most significance in determining ascorbic acid content.

Carotene in collards, kale, and broccoli decreased considerably in concentration during the fall and increased to a lesser extent the following spring. Chard was fairly uniform in carotene content throughout the growing period.

1945 bean trials reveal some advantages of Refugee type, W. T. TAPLEY. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, p. 11).—At Geneva, N. Y., in the 1945 season, five leading strains of Refugee were planted for yield comparisons with Tendergreen and other market type varieties. Leafhoppers caused severe injury to the market type varieties such as Tendergreen, Long Green, Bountiful, Stringless Greenpod, and Keystonean. By comparison the five Refugee strains showed little injury and outyielded greatly the above group. Two Refugee strains, Sensation 1066 and Sensation 1071, yielded over 10,000 lb. per acre as compared with 4,008 for the top market type variety, Logan.

Variations in the carotene content of carrots, E. HANSEN. (Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 355–358, illus. 1).—Chantenay carrots planted in May were sampled at 21-day intervals from August 3 to December 5. Carotene content increased from 2.68 mg. per 100 gm. of fresh weight August 3 to 10.31 mg. on October 24 and 10.54 mg. on December 5. The carrots gained in weight until about November 14, which indicated that growth continued about 3 weeks after maximum carotene was attained. Observation on seven varieties planted in May and again in early August showed that carrots grown during the winter season were much lower in carotene and failed also to show consistent varietal differences. In the summer crop, Imperator was the leading variety with respect to carotene content. Chantenay and Danvers carrots grown at nine different locations in the State showed no extreme variations in carotene, but it did appear that carrots grown in the coastal area as well as at high elevations tended to be somewhat higher in carotene.

Effect of ammonium nitrate as a fertilizer for spinach, H. J. HARPER and F. B. CROSS (*Oklahoma Sta. Bul.* 288 (1945), pp. 15, illus. 4).—Nitrogen is an effective material for increasing the yield of spinach and, since large quantities of ammonium nitrate should be available during the postwar period, a series of field and greenhouse experiments was conducted to determine how to use the material effectively.

Spinach seedlings were severely damaged by ammonium nitrate applied as a top-dressing when the first, second, or third permanent leaves were developing in both field and greenhouse tests. After the fifth and sixth permanent leaf had developed, ammonium nitrate applied at the rate of 200 lb. per acre caused no serious damage and yields were greatly increased on nitrogen-deficient soils.

Ammonium nitrate broadcast at the rate of 100 lb. per acre on a field plot where spinach plants varied in size because of uneven germination killed the small plants and did not injure the larger ones. This fertilizer was more toxic than sodium nitrate in these experiments. It is quite probable that coarse particles of crystalline ammonium nitrate would be less harmful than material containing a higher percentage of finely divided particles. Severe injury occurred where ammonium nitrate crystals or finely divided particles lodged on the leaves of young plants.

Plant growth under controlled conditions.—V, The relation between age, light, variety, and thermoperiodicity of tomatoes, F. W. WENT (*Amer. Jour. Bot.*, 32 (1945), No. 8, pp. 469–479, illus. 7).—There was found a gradual shift of the optimal night temperature for tomato plants, from 30° C. for small plants to 18° for San Jose Canner and 13° for Illinois T19 in the early fruiting stage. A similar change in optimal requirements was observed in 14 other varieties, with each having its peculiar characteristics. In general, the English and greenhouse varieties grew fastest and had the lowest optimal night temperatures.

The usual eastern United States varieties were intermediate between the above two groups as far as night temperature was concerned, but had the lowest absolute growth rates.

When tomato plants were grown in full sunlight, their optimal night temperature was higher than on cloudy days, provided they were shaded by other plants. In artificial light, the optimal night temperature declined very rapidly with decreasing total illumination. Incidence of virus diseases was greatly modified by both day and night temperature.

The differences in physiological response were consistent and large enough so that they might be used to characterize varieties.

Comparative effects of radiation and indolebutyric acid emulsion on tomato fruit production. A. P. WITHEROW. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 329-335, illus. 4).—Two treatments, (1) an initial period of artificial irradiation and (2) the application of indolebutyric acid emulsion, were compared with one another and with no treatment as to their effects on tomato fruit setting. The irradiation treatment begun at that time of the unfolding and greening of the cotyledons caused an increased fruit set on the first five clusters of the Long Calyx variety but the total production of the clusters beyond the fifth was less than for comparable clusters of the control plants. Similar results were obtained with Michigan State Forcing, indicating a definite increase in production on the early clusters as a result of irradiation followed by a definite decrease in later clusters. Indolebutyric acid also increased the set of the early clusters, but had the advantage that there was no decrease in production of later clusters as was the case in irradiated plants.

In conclusion, the author points out the possibility of obtaining an increase of fruit production on the first clusters of late winter or early spring greenhouse tomato crop by giving the plants high irradiances while the plants are still in the seed flats. A combination of irradiation in the seed flats together with treatment of the flowers of the first three to five clusters with a growth substance may have possibilities. The preliminary nature of the study is indicated.

Experimental production of hybrid tomato seed. G. I. OBA, M. E. RINER, and D. H. SCOTT. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 269-276, illus. 1).—Under the conditions of the experiment conducted at the Horticultural Field Station, Cheyenne, Wyo., an ounce of hybrid seed was produced with 3 to 4 hr. pollination work in the field. In 1943 shading plants in the field with cheesecloth resulted in an increase over nonshaded plants of 7.5 percent in set. The highest percentage of set, average 77.4 was obtained in the greenhouse. In addition, the greenhouse plants produced the highest yield of seed per fruit. The benefits accruing from shading in the field are believed to lie in a more favorable temperature and protection from the wind.

Since the number of seeds per fruit varies among varieties, the authors suggest that the parent that is more prolific in seed production be used as the ovule or female parent. On the basis of 8,000 seeds per ounce and the need of about one-half ounce of seed to produce sufficient plants to set an acre, the production of hybrid seed should be economically feasible in view of the increase in earlier yields.

A new tomato for the Tropics. J. L. FENNELL (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 12, pp. 233-234, illus. 2).—Obtained from a cross between a horticultural variety known as Cuban Marglobe and a wild native tomato, the Turrialba is still in the process of selection and improvement. The fruit averages 3.0 to 3.5 in. in diameter and has been in demand as food for military personnel. Segregation is still in process, and until the new variety has been brought into a homozygous condition no seed will be available for distribution.

Dwarfing apple trees by the use of an intermediate dwarf section in the trunk of the tree. T. J. MANEY. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 78 (1943), pp. 127-135, *illus.* 7).—Following a brief discussion of dwarfing apple stocks including Malling IX the author describes an Iowa dwarf apple, known as Clark Dwarf, which has endured temperatures as low as -25° F. without showing injury. Presumably Clark Dwarf was derived from the original Paradise, but differs in various characteristics. When used at the Iowa Station as an intermediate between vigorous seedling roots and named horticultural varieties of apple, the resulting trees were small and bore fruit at an early age. Varieties which have proved most adaptable on Clark stocks are Golden Delicious, Red Delicious and its sports, Jonathan, Grimes Golden, Edgewood, Secor, Early McIntosh, and Erickson. The station is said to have no Clark Dwarf trees for distribution but offers propagation wood to nurserymen.

Magnesium deficiency in Maine apple orchards. J. A. CHUCKA, J. H. WARING, and O. L. WYMAN. (Univ. Maine). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 13-14).—A survey in the autumn of 1944 revealed the presence of varying degrees of magnesium deficiency in 47 of 50 orchards examined, indicating an increasing deficiency situation. Earlier attempts to correct Mg deficiency by application of Mg materials to the soil were only partially successful. Spraying trees three times during July with a solution of 40 lb. of Kieserite in 100 gal. of water gave almost complete control of leaf scorch and improved terminal growth and fruit size materially. Three sprays of 20 lb. of Epsom salts in 100 gal. of water gave good control. It was determined that Epsom salts may be added to the regular lime sulfur scab sprays without reducing their efficiency materially. It is suggested that orchards not showing scorch but located on soils of low Mg content should be treated with dolomitic limestone, and that orchards showing scorch should receive both the limestone and Epsom salts spray treatments.

Changes in reflectance of flesh and skin and in composition of maturing Transparent and Duchess apples. R. V. LORT. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 131-142, *illus.* 5).—During the summer of 1944 spectrographic measurements were made of the flesh and skin color changes in the maturing fruits of Yellow Transparent and Duchess apples. At the same time other fruits were obtained for chemical analysis and measurement. There was a notable increase in spectral reflectance from Yellow Transparent skin and flesh and from Duchess flesh between wavelengths 580 m μ and 700 m μ as maturation progressed.

In Duchess skin there was a decrease in reflectance between wavelengths 400 m μ and 600 m μ and an increase in reflectance between wavelengths 640 m μ and 700 m μ as the fruit matured. The differences were sufficient between samples to indicate the possibility of establishing maturity standards on the basis of color.

There was noted a rapid increase in size and weight as the fruit of both varieties approached maturity. Dextrose, levulose, and sucrose increased, while starch, following an initial increase, decreased, this being most pronounced in the week preceding maturity. Acid, on a percentage basis, decreased in each successive sample, but increased on the basis of total amount in the fruit until just before maturity when a decrease was noted. There was a continuous increase in the sugar-acid ratio, becoming most pronounced as maturity was reached.

The results indicate the possibility of providing the consumer with better apples if the requirements for No. 1 fruit were made more selective.

Variations in size and composition of Yellow Transparent apples packed as III.—U. S. No. 1. R. V. LORT and D. S. BROWN. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 145-148).—Studies of the fruit contained in packed bushel baskets of Yellow Transparent apples obtained from growers showed a wide vari-

ability in size and composition within single baskets and between baskets. The average weight per apple in the facing layer was greater than that of the whole bushel. Variability both as to weight and size was greater in the whole basket than in the facers.

The more mature apples had a higher percentage of levulose, reducing sugars, sucrose, and total sugars than did the less mature fruits. There was evidence that great variation exists in Yellow Transparent apples which meet the requirements of U. S. No. 1 grade, and that highly immature fruit may be marketed under the legal requirements. The authors suggest that this immature fruit may actually result in greatly reduced consumer acceptance and in the ultimate returns to the growers.

The relation of the time factor to the influence of concentration of wax emulsion on the reduction of the rate of transpiration of apples, S. A. PIENIAZEK and E. P. CHRISTOPHER. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 119-122, illus. 1).—Observations on the weight losses of five varieties of apple treated with various concentrations of four protective waxes indicated that the reduction of the rate of transpiration by wax coatings is not constant throughout the storage period. High concentrations of wax emulsions increase the rate of transpiration immediately after application. Later the rate of transpiration of the heavily waxed apples drops much below that of the controls and lightly waxed fruits. The effectiveness of low concentrations of wax emulsions increases with time, but is more constant than that of high concentrations. The longer the period of time after treatment, the closer is the relationship between the concentration of wax emulsion and the extent to which the rate of transpiration is reduced.

Application of high-concentration wax emulsions to cellar-stored Baldwin apples did not cause the development of off-flavors, and fruits treated in mid-October were firmer at the beginning of January than were the controls.

Quantitative study of ethylene production in apple varieties, E. HANSEN. (Oreg. Expt. Sta.). (*Plant Physiol.*, 20 (1945), No. 4, pp. 631-635, illus. 3).—Observations on five varieties of apples, namely, Red Astrachan, Red June, Gravenstein, Delicious, and Newtown, differing in time of maturity from midsummer to late fall, showed the early maturing summer apples to produce more ethylene during ripening than did the later maturing varieties. The maximum rates of ethylene production at 20° C., expressed as cubic centimeters per kilogram 24 hr., were 11.38, 9.27, 5.16, 1.77, and 1.78 cc., respectively. With the exception of Red Astrachan, the amounts of ethylene produced by mature but unripened fruit were well below the sensitivity of the analytical method used. The rates of ethylene production increased rapidly after picking in the summer-maturing varieties and slowly in the later Delicious and Newtown.

Apples at 0° produced ethylene at approximately one-eighth to one-eleventh the rate at 20°. The data indicated that the intensity of ethylene production increases during the storage period. Early maturing varieties showed a distinct climacteric rise in respiration, not apparent in either Delicious or Newtown. The increase in ethylene production during ripening did not appear to be correlated with total CO₂ production.

Respiratory activity and duration of life of apples gathered at different stages of development and subsequently maintained at a constant temperature, F. KROM and C. WEST (*Plant Physiol.*, 20 (1945), No. 4, pp. 467-504, illus. 21).—In this second article on the physiology of fruit (*E. S. R.*, 62, p. 840), studies of the respiratory activity at normal temperatures of Bramley's Seedling apples harvested at various stages of development are reported which showed a marked decline in activity per unit fresh weight during early stages on the tree. This decline continued, but much more slowly, during the main growth period, that of cell enlargement.

The respiratory activity per unit nitrogen and also probably per unit protein is approximately constant during the main period of growth by cell enlargement. The respiratory activity per unit N is somewhat higher during the early stages of growth by cell division.

The authors suggest that respiratory activity of fruit on the tree is not limited by the effective amount of enzyme present, but remains constant as a result of an auto-regulation of substrate concentration, through a linkage between respiratory activity, formation of new cytoplasm, uptake of water, and increasing size of cell.

The drift in respiratory activity per unit fresh weight after harvesting shows, in general, four main phases. Particular attention is given to the third or climacteric phase and to the effect of temperature, oxygen supply, and ethylene upon its onset. Climacteric rise in respiratory activity occurs in fruits on the tree as well as in those harvested at any stage of maturity. The climacteric occurs evidently as a result of ethylene production by the fruit and of an auto-stimulation produced by ethylene when present in the tissues in amounts above critical threshold values.

Prevention of bruises in harvesting apples, C. W. ELLENWOOD (*Ohio Sta. Bmo. Bul.* 235 (1945), pp. 128-131, illus. 4).—Information is presented upon ways and means of reducing the injury to apples during the picking and packing operations. Among points discussed are proper setting of ladders, regulating speed of pickers, selection of proper picking containers, and greater care in grading operations.

Cold storage studies with Minnesota-grown apples, J. D. WINTER. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 143-144; also in *Minn. Hort.*, 73 (1945), No. 9, p. 142).—Observations on Minnesota-grown apples packed in half-bushel baskets and placed in commercial cold storage at 31°-32° F. showed Cortland, McIntosh, Minjon, Minnesota 724, Minnesota 978, and Wealthy capable of keeping in good condition until approximately January 15. Minnesota 790 and Victory kept until about March 1 and Fireside and Haralson until April 1 to May 1. Prairie Spy, Minnesota 643, Minnesota 638, Northwestern, and Wedge were unsatisfactory because of soft scald. There was some evidence that storage at somewhat high temperatures would reduce scald injury to Prairie Spy.

Increased fruit set of Anjou pear with heavy application of nitrogen, E. S. DEGMAN. (U. S. D. A. coop. Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 25-26).—An increased set of fruit was obtained in 1944 with Anjou pears growing in an adobe soil at Medford, Oreg., following the application of large amounts of nitrogen the preceding autumn after harvest. The trees which received 10 lb. of actual N per tree (50 lb. of ammonium sulfate or its equivalent) outyielded trees receiving only 1.5 lb. of N per tree. The increased yield was attributed to an increased fruit set. A lower seed content in the fruit from highly fertilized trees suggested that high N had stimulated the set of seedless pears, and that possibly under more favorable pollination conditions than obtained in 1944 the same differences might not occur. There was indication that fruits from the high N trees softened somewhat more rapidly during the first 3 mo. of cold storage. All samples developed excellent quality when ripe.

Breaking the dormancy of peach seed by treatment with thiourea, H. B. TUKEY and R. F. CARLSON. (N. Y. State Expt. Sta.). (*Plant Physiol.*, 20 (1945), No. 4, pp. 505-516, illus. 5).—Of 23 varieties of peach seeds, treated with various concentrations of thiourea in aqueous solution, the Lovell variety was the only one to have its dormancy fully broken by the treatments.

Among the other 22 varieties, the dormancy of 6 was not broken, 10 germinated 10 percent, and 6 responded to a lesser degree than did Lovell. The most favorable treatments to break the dormancy of non-after-ripened Lovell seed were soaking for 2 to 16 hr. in 0.25 to 0.5 percent aqueous solution of thiourea or placing in a continuous supply of 0.25 percent solution. Seed coats of after-ripened Lovell seed

were checkered in appearance and the cotyledons became enlarged during germination, whereas non-after-ripened, thiourea-treated seed was not checkered nor did the germinating seedlings enlarge in any way. Lovell seedlings which developed from non-after-ripened seeds, after thiourea treatment were dwarfed with shortened internodes and anomalous leaves, typical of seedlings from non-after-ripened excised embryos.

Propagation of peaches from softwood cuttings, G. W. COCHRAN. ([N. Y.] Cornell Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 230-240, illus. 2).—Rapid and extensive rooting was obtained in the winter of 1943-44 from softwood cuttings of greenhouse grown seedling peach trees. The application of hormones was not essential during this season. However, in July only 2 percent rooting was obtained from softwood cuttings taken from the same trees.

All treatments given softwood cuttings of commercial varieties prior to October 1 in 1944 failed to induce rooting. Leafy cuttings treated in October and early November rooted, but died shortly after rooting. Hardwood cuttings taken immediately after killing frosts had defoliated the trees rooted in response to hormone treatments but died. The failure of softwood cuttings to root during the summer of 1944 was believed to have resulted from water deficits created by a plugging of the xylem vessels with wound gum.

Propagation benches were enclosed and equipped with atomizers that maintained a continuous mist in the air above the propagating mediums. Softwood cuttings of Elberta and Rochester taken from 3-yr. trees forced in the greenhouse were rooted on different occasions during March, April, and May by treating with indolebutyric acid and then holding in continuous mist.

Peach varieties by comparison, L. R. DETJEN (*Delaware Sta. Cir.* 17 (1945), pp. 10, illus. 2).—Information is presented on the comparative frost resistance in 1943 of the flower buds in the pink and prepink stages of a large number of peach varieties and on dates of blossoming and maturity and number of days required for fruit development from time of full bloom to maturity.

As to frost resistance, Chinese Cling buds were damaged least, 1.6 percent; and Kalhaven buds most, 57 percent. Elberta was about half way, 35 percent. Among frost-resistant kinds, less than 10 percent injury, were Early Elberta, Halehaven, June Elberta, Rio-Oso-Gem, and Valiant. Blossoming data show an adequate overlapping in pollination for all commonly grown varieties.

The effect of cultivation, straw mulch, and sod plus mulch on the growth and yield of black raspberries, W. P. JUDKINS (*Ohio Sta. Bimo. Bul.* 236 (1945), pp. 166-172, illus. 4).—Logan black raspberry plants set in the spring of 1930 were mulched in part in the fall of 1932 with wheat straw applied at the rate of about 6 tons per acre, followed each succeeding fall by about 2 tons to maintain an adequate covering. The cultivated section was disked during the spring and early summer and seeded to rye in October of each year. Data on growth and yield showed no consistent differences attributable to cultural management.

In a test with Cumberland black raspberries set in 1940, the straw-mulched plots outyielded the cultivated by 16 percent in the years 1943 and 1944. Where the rows were mulched and grass allowed to grow between rows, yields were even lower than in the clean cultivated areas. It is concluded that the use of straw around black raspberries is a desirable practice when straw is available at a reasonable price, particularly on soils subject to erosion.

Tennessee Luscious red raspberry, B. D. DRAIN (*Tennessee Sta. Cir.* 92 (1945), pp. 4, illus. 3).—A descriptive account is presented concerning the origin, propagation, and cultural requirements and the plant and fruit characteristics of a new red raspberry developed by the station in its small fruit breeding program. The new variety has *Rubus idaeus*, *R. kuntzeanus*, and *R. strigosus* in its genetic makeup.

Suwannee—a new home-garden strawberry, N. H. LOOMIS and G. M. DARROW. (Coop. U. S. D. A.). (*Mississippi Sta. Cir.* 123 (1945), pp. 3, illus. 1).—A descriptive account is presented of a new strawberry originated by the U. S. Department of Agriculture from a cross between Missionary and Howard 17 (Premier). The new variety resembles Blakemore in many respects but is said to be entirely free from the variegated coloration known as yellows. At Meridian, Miss., the variety has produced excellent yields of fine quality fruits.

Grafting American grapes on vigorous rootstocks, G. D. OBERLE. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, pp. 7, 8).—The author reviews the results of earlier experiments conducted by the station (E. S. R., 52, p. 443; 67, p. 136), which showed that grafted vines as a rule outyielded own-rooted vines and that weak growing varieties were in particular benefited by grafting on vigorous rootstocks. Unpublished data for the period 1933–42 showed that grafted vines, as they became older, improved in most cases their advantage over the own-rooted vines.

A new investigation, begun in 1936 near Hammondsport in cooperation with the U. S. D. A. Soil Conservation Service, to determine the influence of vigorous rootstocks on the Delaware grape, is showing the value of such stocks. Under the difficult conditions, an old vineyard site on eroded soil, the grafted vines have grown better and are more productive than the own-rooted. Certain rootstocks, Nos. 3306, 3309, and 1202, show particular promise. In addition a new study has been set up at the Vineyard Laboratory at Fredonia to test rootstocks for Concord and Niagara. The processes of grafting and handling grafted vines are discussed.

Potassium deficiency in a New York grape vineyard, D. BOYNTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 246–248, illus. 1).—This paper reports the diagnosis and partial control of potassium deficiency in a young commercial vineyard located on a light phase of Dunkirk silt loam in Monroe County, N. Y. Of the eight varieties in the vineyard, six showed symptoms of interveinal chlorosis and marginal scorching of the leaves. Of the affected varieties, Delaware and Portland were most seriously scorched, so that by harvesttime practically all the leaves on many vines were rolled and shriveled or had abscised. Analysis of leaves in late September revealed that K percentages were extremely low and Ca and Mg percentages extremely high in the affected plants. Surface soil from the scorched area contained half as much replaceable K as surface soils from areas where scorch was less evident. When corrective treatments of potash, potash and boron, and boron were tried, the potash-treated vines showed some improvement as to leaf scorch, but the leaves were still low in comparison with normal. Boron did not appear to have any effect on the situation.

The tartrate content of Maryland-grown American grape varieties, H. F. BERGMAN and C. A. MAGOON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 253–255).—Prompted by an acute shortage of tartaric acid, a study was undertaken upon the tartrate content of a number of American grapes growing in the vineyard at Beltsville, Md. Each variety was sampled when the fruit was market-ripe. The highest tartrate content was found in the variety Leverkusen, with 1.4 to 1.5 percent. The varieties Creveling, Dakota, Dracut Amber, Elirbach, and Kentucky had also high contents of tartrate. Among those with the lowest contents were Moore Early, Seneca, and Wetumka.

Effect of zinc on yield and cluster weight in Muscat grapes, W. B. HEWITT and H. E. JACOB. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 256–262, illus. 2).—The variable responses of Muscat vines to the application of zinc sulfate solution indicate that shelling of berries and the development of small “shot” berries is, in this variety at least, a complex situation not related solely to zinc. In certain vineyards treatment was effective, while in others the treatment

had no measurable effect on shelling. The response varied apparently with the season.

In all the tests, the most consistent response obtained from treating the pruning wounds with zinc sulfate solution was the increased number of normal seeded berries per cluster. The size of the berries, both seeded and seedless, was influenced little if at all. The number of seedless (shot) berries per cluster was decreased slightly by the treatment in 1938, but the difference was significant in only 6 of the 10 plots. The time of ripening was not advanced by the treatment, but it was sometimes delayed where the crop was markedly increased.

Some vineyards responded every season to zinc, the treated vines producing consistently better crops than did untreated vines. Other vineyards of the same varieties, although affected severely by shelling, did not respond to zinc sulfate.

Boron content of olive leaves, C. J. HANSEN. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 78-80).—Analyses of the leaves of olive trees of normal growth and those showing deficiency symptoms with respect to boron showed marked differences. The B content of leaves showing severe deficiency symptoms fell usually within the range of 8 to 12 p. p. m., while most normal leaves contained 19 to 33 p. p. m. The injection of dry boric acid into branches was effective in supplying B to the trees. Good success was obtained also by applying borax to the soil.

The olive was found to be considerably more resistant to excess B than was the peach, apple, plum, or apricot. Plants, such as the olive, that are not easily injured by excess B do not accumulate much B in their leaves, while sensitive plants such as blackberry, fig, and grape build up rather high concentrations.

Cambial activity and starch cycle in bearing orange trees, S. H. CAMERON and C. A. SCHROEDER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 55-59).—Observation upon cambial activity and starch cycle in full bearing Valencia orange trees showed the first evidence of cambial activity in spring in the twigs and small branches bearing new shoot growth. Initiation of activity in other parts of the tree was very irregular and appeared to depend on relatively slow basipetal progression above and below the soil. In the above-ground parts cessation of cambial activity is in basipetal sequence, the same as initiation. In the roots cessation is acropetal, opposite to that of initiation. Fluctuations in starch content are confined to tissues close to the cambium and to parts adjacent to actively growing shoots or roots. Other portions of the tree contain large quantities of starch at all times. Heavy fruiting reduces starch content in the above-ground parts, confined mainly to the twigs and small branches.

Nitrogen in bearing orange trees, S. H. CAMERON and O. C. COMPTON. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 60-68, illus. 2).—An earlier paper (E. S. R., 72, p. 627) dealt with the subject in a more limited manner. In the present study 36 Valencia trees were dug at intervals of 3 weeks throughout a period of 2 yr. Nearly one-half the total nitrogen of the trees was in the leaves, approximately one-tenth in the twigs and shoots, about one-fourth in the branches and trunk, and somewhat less than one-fifth in the roots. Except in the leaves and bark, fluctuations in N content were not large. A maximum N content occurs in the tree just prior to the initiation of growth activity in the spring. New growth, blossoming, and fruit setting result in shifts in location and a decrease in amount of N through losses in shed leaves, blossoms, and young fruits resulting in a minimum of N about midsummer. Fruiting did not produce direct measurable effects on the N content of the tree. An indirect effect is suggested because of the inverse relationship between the amount of new growth and the quantity of fruit on the tree. Additions of N to soil in which the N supply is high does not apparently result in an immediate increase in the N content of the tree.

Effects of different amounts of potassium on growth and ash constituents of *Ananas comosus* (L.) Merr., C. P. SMERIS and H. Y. YOUNG. (Pineapple Res. Inst., Hawaii.) (*Plant Physiol.*, 20 (1945), No. 4, pp. 609-630, illus. 8).—Studies of the effects of high v. low amounts of potassium on the growth and ash constituents of pineapples growing in solution cultures supplied with equal amounts of nitrogen from nitrate or ammonium salts showed that the plants of the high-potassium cultures in the nitrate series weighed 40 percent and in the ammonium series 73 percent more than those of the low-potassium cultures. The differences in stem weights between the high- and low-potassium cultures were much greater than those of plant weights; they were greater for the high-potassium cultures, 94 percent in the nitrate, and 185 percent in the ammonium series.

Ash values and succulence, the latter as measured by the water content of the tissues, were generally higher in the high- than in the low-potassium cultures.

Potassium was from two to seven times higher in the tissues of the high- than of the low-potassium plants.

The calcium and magnesium content of the tissues was many times higher in the low- than in the high-potassium plants. The calcium content of the tissues was appreciably lower, however, in the plants supplied with ammonium- than with nitrate-nitrogen. The phenomena and antagonism between potassium on the one hand and calcium and magnesium on the other are discussed.

Phosphorus was more abundant in the high- than in the low-potassium plants. The phosphorus content of the plants in the ammonium series was greater than in the nitrate series.

The plants in the high-potassium cultures contained more iron than in the low-potassium cultures. Also, those of the ammonium series contained more iron than of the nitrate series, indicating that the higher H-ion concentrations in the ammonium series had favored the absorption of iron by increasing its solubility.

Coconuts in tropical America, D. M. CRAWFORD (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 11, pp. 203-206, 215-216, illus. 6).—Wild coconut palms grow on the eastern coast from the State of Veracruz in Mexico down to the State of Bahia in Brazil. On the west coast palms occur from the State of Nayarit in Mexico south to Ecuador. In addition palms are found on numerous islands. The author discusses the probable origin of the coconut, how the palms propagate and grow, uses of the coconut for food and production of copra, and the use of the leaves and wood. Most of the copra is produced in Mexico, Central America, the Caribbean Islands, and along the northern coast of South America. Developments in the postwar period are forecasted.

Transpiration responses of Persian walnuts and filberts sprayed with bordeaux mixture, P. W. MILLER and C. E. SHUSTER. (*U. S. D. A. coop. Oreg. Expt. Sta.*). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 10, pp. 465-469).—The rate of transpiration after spraying with bordeaux mixture increased in 41 percent and decreased in 59 percent of the trials with seedling walnuts involving a total of 124 pairs of plants. In the case of 59 pairs of filbert seedlings, 54 percent of the trials showed an increase in transpiration following bordeaux treatment and 46 percent a decrease. The extent of the increase or decrease varied so greatly in the different tests that the results are described as conflicting. Since the plants were seedlings, the inconsistent responses may have been associated with inherent genetic differences. The authors suggest also that the use of mature leaves may have lessened the response to bordeaux mixture. Where two concentrations of bordeaux mixture were compared, there were no consistent differences between the high- and low-lime mixtures.

The minor element content of normal, manganese-deficient, and manganese-treated English walnut trees, A. P. VANSELOW. (*Calif. Citrus Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 15-20).—Spectrographic analyses of

samples of walnut leaves from untreated and treated manganese-deficient trees and from normal trees showed that a deficiency of manganese does not appear to cause any material disturbance in the amounts of other minor elements occurring in the leaves. Manganese deficiency was corrected by spraying the trees in early summer or by injecting the dry salt into holes in the trunk or limbs. There was observed considerable difference in the content of various minor elements in so-called normal leaves from two areas. In general, the minor element content of the normal walnut leaf resembled that of a normal citrus leaf. Barium was somewhat lower and molybdenum and nickel somewhat higher in the walnut leaf.

Influence of soil moisture conditions on apparent photosynthesis and transpiration of pecan leaves, A. J. LOUSTALOT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 12, pp. 519-532, illus. 5).—Determination of the effects of both excessive and inadequate amounts of soil moisture on photosynthesis and transpiration of pecan leaves of seedlings growing in coarse sand and in heavy soil showed in all cases that both soil moisture extremes caused subnormal rates, the degree of reduction depending primarily upon the severity and duration of the adverse conditions. Under drought conditions a marked reduction in the rates of both photosynthesis and transpiration occurred 1 or 2 days before the moisture in the soil or sand had reached the wilting point. Transpiration and photosynthetic rates were usually depressed at about the same time.

The amounts of reduction in the rates of photosynthesis and transpiration of pecan leaves subjected to drought were closely correlated with the proximity of the soil moisture to the wilting point as well as with the atmospheric conditions during the critical period of moisture shortage. The rate of recovery in photosynthesis and transpiration activity from the effects of drought was usually very rapid during the first day or two after termination of the drought, but several days were required before the rates reached normal or their maximum.

In the case of leaves of seedlings whose roots were in water, a substantial reduction in the rate of photosynthesis was noted 5 days after submersion, but no consistent and definite depression of transpiration occurred until several days later. Photosynthesis was depressed to a greater degree in the afternoon than in the mornings, as was the case under drought conditions. The photosynthetic rate of leaves of flooded plants in sand was not reduced to cessation as was the case of plants in soil, suggesting that the oxygen supply was more greatly reduced in soil than in sand.

The percentages of organic N and ash in tissues of seedlings subjected to flood conditions in sand for 35 days were considerably lower than in similar tissues of control plants. There was a slow recovery after drainage. The percentages of organic N and ash were usually slightly lower in drought plants than in the check plants. The results emphasize the importance of adequate drainage and also of an adequate moisture supply in pecan groves.

Incompatibility in Amazon cacao, A. F. POSNETTE (*Trop. Agr. [Trinidad]*, 22 (1945), No. 10, pp. 184-187).—A description is offered of a new floral character and of the petioles of some types of cacao introduced into Trinidad from the upper Amazon region and Ecuador. Hand pollinations demonstrated that a high proportion of these Amazon types are self-incompatible but differ from the self-incompatible Trinitario types in being cross-compatible. The known distribution of self-incompatibility in cacao populations is discussed and a theory is advanced in explanation.

An annotated bibliography of Cinchona-growing from 1883-1943, R. E. MOREAU (*Nairobi, E. Africa: Govt.*, 1945, pp. 41+).

Marabú in Cuba, J. C. CRANE (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 12, pp. 227-229, 237, illus. 3).—Information is presented on the distribution, growth habits, and methods for eradicating a leguminous shrub or small tree known

as marabú, which has taken over thousands of acres of valuable agricultural land in Cuba. The wood has some value in the production of charcoal.

A condensed history and classification of the genus *Rosa*, C. D. PARIS and T. J. MANEY. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 78 (1943), pp. 197-209).—With a view to presenting in condensed form some of the pertinent facts relative to rose history and rose classification, the authors present briefly the history of rose classes to which the most important named varieties owe their origin.

Nitrogen utilization trials with highway plantings and woody ornamentals, L. C. CHADWICK (*Ohio Sta. Bimo. Bul.* 235 (1945), pp. 126-127).—Studies of the effect of heavy applications of nitrogenous fertilizers in the form of ammonium sulfate, ammonium nitrate, and a 10-6-4 NPK mixture showed in most instances that the complete fertilizer gave the best results. This was particularly true when the 10-6-4 material was compared with ammonium sulfate on grass, Hall's honeysuckle, Amur River privet, and redbud. Sweetclover, winter honeysuckle, elm, and black locust did about as well with either fertilizer. Certain plants, namely, border forsythia, hawthorn, and *Symphoricarpos chenaulti* did a little better with ammonium sulfate than with complete fertilizer. In the case of Colorado spruce, Scotch pine, and American arborvitae, growing on the University campus, no striking or consistently visual differences could be detected between the trees receiving the different types of fertilizer or in fact between checks and fertilized trees.

FORESTRY

Spruce-fir silviculture, M. W. DAY (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 1, pp. 59-65).—The salient points of spruce-fir silviculture can be stated briefly as follows: (1) Cut early, often, and lightly; (2) protect young growth; and (3) remove overtopping hardwoods.

At an early age, some trees may be cut for Christmas trade and the operation repeated at intervals until the trees attain 30 ft. height, when it is possible to obtain some pulpwood. In the selection of crop trees, white spruce should be favored over balsam fir. Stands over 30 yr. of age will not usually produce salable Christmas trees, but this fact does not signify that such stands should not be thinned. Balsam fir is subject to several wood rotting fungi that cause much cull, wind breakage, and death in older stands.

The results obtained under a selection system depend to a large degree upon the proper selection of trees to be cut. The first trees to be cut should be those showing signs of poor health or maturity. The desirability of marking all stands before cutting is emphasized.

Dense even-aged spruce-fir stands over 70 yr. present a special problem since advance reproduction is often lacking in such stands. The shelterwood method, in which the first cut is limited to about 25 percent of the merchantable volume, is desirable as this system encourages reproduction. As soon as adequate reproduction has been obtained, in a matter of some 10 yrs., further cuttings can be made to advantage.

Among species found associated with spruce-fir, paper birch and aspen are usually most abundant. Other species found are white pine, red maple, elm, balsam poplar, black spruce, white cedar, and tamarack. A large proportion of hardwoods is usually undesirable. However, when a valuable species such as white pine is present, it should be retained.

Protection of young growth is highly desirable. If skidding damage is held at a minimum and if trees are felled where they will do the least damage, injury to reproduction can be reduced greatly.

Clear cutting of spruce-fir stands results in heavy slash accumulation which offers not only an increased fire hazard but prevents the establishment of reproduction.

Spruce and fir should not be cut in release operations unless the trees are badly defective or are mature.

The regeneration of Douglas fir, *Pseudotsuga taxifolia* Britt., in the New Forest. E. W. JONES (*Jour. Ecol.*, 33 (1945), No. 1, pp. 44-56, illus. 2).—Douglas fir, a North American forest tree introduced into Great Britain early in the nineteenth century, has become naturalized to the extent that natural regeneration is occurring in many localities. A study of regeneration in one area indicated that establishment appears to be largely determined by the presence of a carpet of coniferous litter with deciduous litter providing unsuitable conditions. Bare mineral soil proved suitable also as a seedbed. When the canopy becomes sufficiently open to permit Douglas fir establishment, other vascular plants begin to invade also, so that in a few years further entry of Douglas fir becomes impossible. The coincidence of a good seed year with a year of cutting would apparently be needed to give a good stocking of Douglas fir.

Vegetative propagation of conifers.—XII, Rooting of Norway spruce cuttings in the greenhouse. N. H. GRACE and J. L. FARRAR (*Canad. Jour. Res.*, 23 (1945), No. 5, Sect. C, pp. 150-165, illus. 1).—A total of 80 percent of Norway spruce cuttings rooted when placed in a peat-humus-sand medium in propagation frames in a greenhouse. Canadian peat moss and Swedish peat media proved inferior, but a weekly addition of potassium acid phosphate and magnesium sulfate solutions to Swedish peat resulted in 96 percent of rooting. Beneficial results with peat humus were related to available nutrients.

Medium cuttings, 3 to 6 in. long, rooted 96 percent and long cuttings, 6 to 10 in., 71 percent. Uncovered cuttings and those covered with celloglass rooted better than those under cheesecloth or factory cotton screens.

Plant hormone chemicals, when applied in talc dust, tended to reduce the rooting of Norway spruce cuttings. Indolebutyric acid showed neither harmful nor beneficial effects. Naphthylbutyric acid and potassium naphthylhexoate, while similar in effect, tended to be less injurious than naphthylacetic acid. Naphthylbutyric acid at 2,000 p. p. m. level in a charcoal carrier gave 98 percent rooting. Mean root length was increased by the use of 50 p. p. m. each of thiamine and nicotinic acid. While nutrient salts and naphthylbutyric acid, used separately, tended to reduce mean root length, the combination had no injurious effect.

Hastening the extraction of jack pine seeds. R. K. LEBARRON and E. I. ROE. (U. S. D. A. coop. Univ. Minn.). (*Jour. Forestry*, 43 (1945), No. 11, pp. 820-821).—Evidence was obtained that jack pine seeds can be extracted with equally good results by kiln drying at lower temperatures and for shorter periods than those now in use. The adoption of the methods may open the way to considerable savings in labor and fuel costs. Extraction at room temperatures and humidities after heating the cones for about 10 sec. is also suggested as a possibility deserving investigation.

Influence of size and portion of cone on seed weight in eastern white pine. J. W. WRIGHT. (Ind. Expt. Sta.). (*Jour. Forestry*, 43 (1945), No. 11, pp. 817-819).—In the fall of 1938 cones were collected in the vicinity of Petersham, Mass., from six white pine trees ranging in age from 56 to 86 yr. of age and which had been felled by the September hurricane of that year. The cones from each tree were grouped into three length-classes, and then each cone was cut into three equal portions, apical, middle, and basal. The seeds were extracted and handled separately.

The fresh weight of the seed was found to increase significantly in progressing from small to large cones and from the apical to the basal portion of the cone. There were also significant differences in seed weight between trees. There was no obvious correlation between seed or cone size and the age, diameter, or growth rate of the parent tree. The sorting of seeds according to portion and size of cone and parent tree might be used to reduce the number of seeds necessary to obtain a seed sample with an average weight of a given accuracy.

Reduced vigour, chlorophyll deficiency, and other effects of self-fertilization in *Pinus*, L. P. V. JOHNSON (*Canad. Jour. Res.*, 23 (1945), No. 5, Sect. C, pp. 145-149, illus. 1).—Seedlings obtained from self-pollinating *Pinus strobus* and *P. sylvestris*, white and Scotch pines, respectively, were at 4 yr. of age significantly smaller than comparable seedlings derived from open- and intraspecific-pollinations. In white pine 11 of 46 seedlings of selfed origin showed pronounced chlorophyll deficiency. Selfing had an unfavorable effect on seed set and seedling emergence in Scotch pine and on seed set in *P. resinosa*, red pine.

The author believes that the results have a practical bearing on forest regeneration after logging. The practice of leaving widely spaced single seed trees may well need modification, so as to provide better opportunity for cross-pollination.

Observations on the causes of the flow of sap in red maple, C. L. STEVENS and R. L. EGGERT. (N. H. Expt. Sta.). (*Plant Physiol.*, 20 (1945), No. 4, pp. 636-648, illus. 1).—Red maple trunks with both roots and crown removed produced sap of normal quality regardless of the position of the trunk provided a supply of water was available. Water moved into the severed trunks only when the air temperature dropped below 32° F. The intake continued until the interior of the tree was frozen. Ice was formed at this time in all tissues of the tree but more plentifully in the outer xylem. Sap flowed from the spout as soon as the ice in that portion of the tree was melted. When water was available sap flow from the severed trees followed the same daily pattern as that from the control trees.

The authors conclude that the flow of maple sap in early spring is not dependent on root pressure or on the lifting power of transpiration, but is probably brought about by the combined action of several factors, the most important of which is the daily change in the temperature in the air. Freezing temperature causes the formation of ice crystals in the phloem and outer layers of the xylem. Water from the inner layers of the xylem is drawn toward the crystals as they form, thus setting up the tension which results in lifting sap from the roots to the upper parts of the trees, a process that continues until stopped by freezing. When released by thawing of the ice crystals, sap flows through the tissues and out at any convenient opening.

DISEASES OF PLANTS

Proceedings of the Association of Applied Biologists (*Ann. Appl. Biol.*, 32 (1945), No. 3, pp. 261-262, 277-278, 279-281).—The following brief papers are of interest to plant pathology: Bloat or Eelworm Disease of Onions—Recent Investigations, by T. Goodey (pp. 261-262); The Genetic Analysis of Disease [in General], by C. D. Darlington (pp. 277-278); Inheritance of Resistance to Blight in Potatoes, by W. Black (pp. 279-280); Some Genetical Aspects of Resistance to Potato Viruses, by G. Cockerham (pp. 280-281); and Diseases and Pests at the Welsh Plant Breeding Station, Aberystwyth, by T. J. Jenkin (p. 281).

Virus names used in the Review of Applied Mycology, S. P. WILTSHIRE (*Imp. Mycol. Inst. [Mimeog. Pub. 1] (1944), pp. 44*).—"The common names for many diseases are accepted throughout the English-speaking world, they are frequently without ambiguity, and they will presumably continue to be used after the viruses have received internationally acceptable scientific names. It was decided, therefore, that, with one or two exceptions, viruses should be indexed in the *Review* under common names derived from the English common names of the diseases they cause." In this list the disease names proposed are given in capital letters. For each, a reference is made to a description of the disease. The first name for the causal virus, which is usually formed by adding "virus" to the common name of the disease, is the name accepted. Synonyms are arranged in chronological order indented under each accepted name.

The electron micrography of crystalline plant viruses, W. C. PRICE, R. C. WILLIAMS, and R. W. G. WYCKOFF (*Science*, 102 (1945), No. 2646, pp. 277-288, illus. 1).—A preliminary note on the results of studying preparations of purified plant viruses by this technic, through which it was found possible to record the orderly way in which the particles deposit from solution. The authors are developing further this way of examining the intimate details of crystal structure.

The use of abrasives in the transmission of plant viruses, H. KALMUS and B. KASSANIS (*Ann. Appl. Biol.*, 32 (1945), No. 3, pp. 230-234, illus. 2).—Celite and animal charcoal proved as effective as carborundum for increasing the number of lesions produced by a given inoculum of several plant viruses; 400-mesh carborundum was the most effective among the different sizes tested, giving a result equivalent to increasing the virus content 100 times. Some preparations of carborundum and charcoal reduced the infectivity. Uninjured plants resisted infection when virus solutions were sprayed over them. Leaves previously rubbed without abrasives developed only a few lesions in contrast to the large numbers forming after use of abrasives. In 3 hr. after rubbing with abrasives, leaves had regained their resistance to spraying with virus solutions. The effects of rubbing the leaves with abrasives are described in detail, and their significance is discussed.

Infection experiments with detached water-congested leaves, J. JOHNSON. (Wis. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 35 (1945), No. 12, pp. 1017-1028, illus. 3).—Using many different organisms, including both parasitic and saprophytic bacteria and fungi as well as other substances such as toxins, viruses, India ink, and dyes, the author studied the mechanism of infection in detached artificially water-congested leaves of tobacco and other plants in refrigerator pans as moist chambers. The individual leaves were congested artificially by internal water pressure followed by application of the inocula in various ways on wounded and unwounded surfaces. Penetration rarely occurred through unwounded normal (i. e., uncongested) tissues, but stomatal penetration frequently took place through unwounded water-congested tissues without any injury to the cuticle or exterior propulsion of the inoculum. Bodily penetration through the stomatal openings depends on the presence of congestive water and leaf-surface water, with particles of sufficiently small size to pass the openings. The mechanism involved is the establishment of a capillary force by formation of a channel of water between leaf-surface water and congestive water through which solutions or suspensions are transported. Penetration in wounded plant tissues is usually immediate; when the leaf is also water-congested, bacterial parasites, in particular, may be carried for considerable distances into the adjacent intercellular areas. Natural barriers to infection are destroyed by wounding; hence natural variations in resistance to disease may be broken down.

Two *Alternaria* diseases of cruciferous plants, J. F. RANGEL. (Cornell Univ.). (*Phytopathology*, 35 (1945), No. 12, pp. 1002-1007, illus. 3).—*A. brassicae*, cause of a leaf spot, pod spot, and general browning of heads of cauliflower, broccoli, and other crucifers, is also responsible for damping-off, wire-stem, and spotting of seedlings. This fungus is readily distinguished morphologically and culturally from *A. herculea*, which likewise causes a disease of crucifers. Both species are virulent pathogens, able to infect the susceptible at any age and independently of injuries, provided there is a period of wetting for at least 18 hr. The seeds may carry both pathogens as spores or as latent mycelium. The spores of *A. brassicae* may retain their viability and pathogenicity for over 6 mo. Seedlings grown in infested seed beds may carry the inoculum; in the field, the sources of inoculum are the dead lesions and decaying plant parts. Water is the main agent of dissemination. Semesan and Arasan proved effective in reducing the amount of damping-off and wire-stem on seedling grown from surface-inoculated seeds.

Agar medium and technique for isolating *Pythium* free of bacteria, B. SLEETH. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 12, pp. 1030-1031).—A culture medium consisting of 10 gm. dextrose, 2 gm. $(\text{NH}_4)_2\text{H}_2\text{PO}_4$, 1 gm. KNO_3 , 1 gm. MgSO_4 , 25 gm agar, and 1,000 cc. distilled water gave excellent results in isolating *Pythium* free of bacteria from damped-off guayule seedlings. By this method a small piece of unsterilized diseased material is placed on a quarter section of sterile medium in a petri dish. The agar section is then transferred to a separate sterile petri dish and inverted by means of a small flexible metal spatula. If present, the *Pythium* hyphae grow through to the upper surface of the agar block within 24 hr. at laboratory temperature. Hyphal tip transfers usually result in pure cultures.

Diagnosis of mineral deficiencies in crop plant, T. WALLACE (*Trop. Agr. [Trinidad]*, 22 (1945), No. 11, pp. 207-209).—A summary of two lectures considering visual symptoms, visual and chemical diagnoses, foliage spraying and plant injection, and soil analysis and field trials.

Anticrittogamici ed insetticidi [Fungicides and insecticides], U. PRATOLONGO (*Roma: Ramo Ed. Agr.*, 1945, 2, ed., rev. and enl., pp. 231, illus. 10).—Included are general subject and author indexes, an index by host plants to the diseases and pests, a detailed table of contents, and over three pages of bibliography.

Studies with copper fungicides, VII, VIII, R. L. WAIN and E. H. WILKINSON (*Ann. Appl. Biol.*, 32 (1945), No. 3, pp. 240-247).—The following contributions are included (E. S. R., 91, p. 40).

VII. *The solution of copper from dressings on the pea seed* (pp. 240-243).—The authors found through this study that, during the process of swelling, pea seed yield substances to water which are capable of dissolving the insoluble Cu dressings normally applied to prevent preemergence damping-off; this occurred where soil factors were eliminated and irrespective of whether the fungicide was on the surface of the seed or applied separately. Cu was taken into solution from dried 4-4-50 bordeaux by water in which peas had been soaked, showing the formation of soluble complex forms of Cu to be involved. Chemical examination of the solution obtained from soaking peas in water revealed volatile acids or their salts to be present together with a proteinlike material in colloidal solution. The occurrence of amino derivatives and other nitrogenous materials, as well as carbohydrates, was demonstrated and evidence was also obtained of the presence of asparagine and citrate. It is suggested that both the fungicidal and phytocidal actions of Cu dressings on pea seeds depend largely on the effect of the seed exudates—notably colloidal proteinlike material and certain amino derivatives—in bringing the Cu into solution.

VIII. *The penetration of copper into germinating peas* (pp. 243-247).—Three pea varieties exhibited less injury when treated with solutions of simple cupric salts than with solutions of equivalent strength in which the Cu was in complex form. On adding supplementary pea exudate to CuSO_4 solution—thus converting some cupric to complex Cu—greater damage followed; in spite of the greater phytotoxicity of the complex forms, the Cu intake by the seeds was less. Sealing the micropyle had little influence on the intake of water or Cu by the seeds. Colorimetric tissue tests on treated peas indicated a high concentration of Cu in the testa and embryonic radicle, with only small amounts in the cotyledons; these observations were largely confirmed by chemical analyses. The findings suggest that when Cu dissolves from dressings on pea seeds much of it becomes fixed on the testa, thus providing fungicidal protection. The soluble complex forms of Cu produced by pea exudate are markedly phytotoxic, and injury to the embryonic radicle is regarded as the main cause of damage to the seed.

A new soil fumigant for root knot and other pests, J. R. WATSON. (Fla. Expt. Sta.). (*Citrus Indus.*, 26 (1945), No. 11, pp. 8, 21).—A brief summary of control methods through use of rotations and chemicals, and a reference to the new soil fumigant, D-D, which is said to show considerable promise.

Gliotoxin, a fungistatic metabolic product of *Trichoderma viride*, P. W. BRIAN and H. G. HEMMING (*Ann. Appl. Biol.*, 32 (1945), No. 3, pp. 214-220, illus. 1).—Gliotoxin is shown to be a metabolic product of this fungus; a semi-continuous apparatus for its production is described and illustrated. Ammonia N was found preferable to nitrate N, but a wide range of sources of C and of organic or inorganic S proved suited to its development. No organic supplements to a glucose-mineral medium have been found to affect gliotoxin production. The data presented show gliotoxin to be moderately toxic to a wide range of bacteria, actinomycetes, and fungi; *T. viride* itself proved resistant to the toxic effects. The substance exhibited fungicidal activity when applied as a dust to cereal seeds bearing various seed-borne infections; it was, however, inferior to organic mercurials for this purpose. Its value as a fungicide for controlling plant or animal infections is reduced by the instability of aqueous solutions except at low pH.

Observations on *Gibberella saubinetii* (Mont.) Sacc. on cereals in Ireland in 1943 and 1944, R. MCKAY and J. B. LOUGHNANE (*Roy. Dublin Soc., Sci. Proc., n. ser.*, 24 (1945), No. 1-5, pp. 9-18, illus. 3).—As a sequence to the epidemic of *G. saubinetii* infection in 1942, a considerable amount of infected grain was used for seed the following season; this resulted in a number of cases of thin shoots due to poor germination and to seedling blight. The latter was produced experimentally in the greenhouse by sowing wheat in sterilized soil inoculated with a pure culture of *G. saubinetii*. Plants killed by this phase of the disease are a potential source of infection to the standing crops, since they produce perithecia. Similar fructifications may be formed at the base of plants recovering from the seedling blight phase. The ear blight and scab phases were both rather prevalent on wheat during 1943-44; the approximate percentage of affected crops showing perithecia for these years were 58 and 28, respectively. No serious reductions in yield or shriveling of the grain occurred in either season, since climatic conditions favored the host at its most critical period and the fungus attacks came late in the season.

New physiologic races of *Ustilago hordei*, V. F. TAPKE (U. S. D. A. and [N. Y.] Cornell Expt. Sta.). (*Phytopathology*, 35 (1945), No. 12, pp. 970-976, illus. 1).—Five new physiologic races of *U. hordei* were found in 244 collections; including a previous study (E. S. R., 89, p. 225), a total of 13 races in 444 collections from 33 States have now been isolated. Races 1, 5, and 6 comprised 86.5 percent of the total collections; most prevalent were races 1 and 6 in the winter barley region, race 5 in California and Washington, and race 6 elsewhere throughout the United States. The number of races found in individual States ranged from 1 to 6. Minor differences in spore characters, awn destruction and compactness, and exsertion of smutted heads were not infrequently associated with different races. Pannier (C.I. 1330)—one of the 8 differential varieties—proved highly resistant to the widespread races.

Distribution of races of *Tilletia caries* and *Tilletia foetida* and their relative virulence on certain varieties and selections of wheat, H. A. RODENHISER and C. S. HOLTON (U. S. D. A. and Wash. and Idaho Expt. Stas.). (*Phytopathology*, 35 (1945), No. 12, pp. 955-969).—The 7 new races described make a total of 31 known races, of which 16 are *T. caries* and 15 *T. foetida*; the latter is now predominant throughout the United States. *T. caries* is found over a considerable area. It is common in the durum section of the upper Mississippi Valley and greatly increases in relative prevalence toward the intermountain area of the Northwest, where it was formerly predominant. Several of the races of each species are widely distributed; others are less so. The distribution of specific wheat varieties is the most important factor governing the prevalence of specific races within a given area. A number of varieties and selections were found resistant to all races of ordinary bunt tested. Thus far the Hope factor seems to give adequate control of

these races in the spring wheats, while lines derived by combining the so-called Oro and Martin factors as in Rex \times Oro and Rio \times Rex supply the necessary resistance for the winter types. Theoretically, selections from crosses between Martin and Redit should likewise possess the desired resistance. Dwarf bunt is a real menace to wheat production, particularly in certain sections of Utah, Idaho, and Montana; it is increasing in importance in Washington State and has been found in Wyoming, Colorado, and New York. The varieties Relief, Cache, and Wasatch, although resistant to dwarf bunt, are susceptible to a few races of the ordinary bunt fungi; hence there remains the problem of combining factors that will supply resistance to both types.

The red-spot disease of broad beans (*Vicia faba* L.) caused by *Botrytis fabae* Sardinia in China. T. F. YU (*Phytopathology*, 35 (1945), No. 12, pp. 945-954).—This leaf spot was proved due to *B. fabae* and is identical with the disease in Spain described by Sardinia in 1929. Although widely distributed in China, it has been of little economic importance except in regions where atmospheric humidity is high. Leaves, stems, and pods are attacked, and plants in the field are often defoliated under excessive moisture. Common laboratory media proved suitable for cultures of the fungus; the mycelium grows at 6°–36° C. (optimum 24°–26°) and thrives best at pH 4.4 to 5.2. The fungus has not been known to infect non-leguminous plants; among the legumes, it attacks *V. faba*, *V. sativa*, *Pisum sativum*, and *P. sativum arvense*. Experimental work indicated that the pathogen may overwinter as sclerotia, although they have never been observed on diseased plants in nature. Overwintering by conidia is doubtful. No attempts at control have been made.

Some factors determining the infection of corn by *Ustilago zeae* (Beckm.) Unger, R. E. WILKINSON and G. C. KENT. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 4, pp. 401-413, illus. 3).—The Davis spiral whorl method (E. S. R., 75, p. 792) of inoculating corn with this smut fungus in the greenhouse was improved by using triethanolamine oleate, which proved the best detergent tried for use with sporangia suspended in carrot decoction. It was less toxic to the host tissues, more constant in composition, and promoted a higher degree of infection of greater severity than fish-oil soap, sodium ricinoleate, dreft, saponin, ethylene glycol, kerosene, or several oils similarly used. The sporidial suspension—after dilution 1 : 100 with carrot decoction plus the triethanolamine oleate—was still highly effective; the range of pathogenicity exhibited by matched pairs of sporidia, when tested on a single inbred line of corn, extended from the production of a few small galls to many large galls or necrotic areas. Two solopathogenic (homothallic-pathogenic) lines were isolated that produced normal-sized nodal galls but only pin point leaf galls. A composite inoculum of eight matched pairs of sporidia was less virulent than the most aggressive of the matched pairs. In tests of a vacuum method of inoculating corn with *U. zeae*, the severity of attack was enhanced under the reduced pressure. There are 19 references.

Control of foot rot (*Phoma* sp.) of flax. A. E. MUSKETT and J. COLHOUN (*Nature* [London], 156 (1945), No. 3966, pp. 538-539).—The results of further tests (E. S. R., 93, p. 592) would appear to prove it unadvisable to treat flax seed with New Improved Ceresan if the seed has a moisture content exceeding 10 percent; in the case of seed with a lower moisture content a period of not more than 8 weeks under good storage conditions should elapse between treating and sowing. Arasan-treated seed showed no reduction in germination after storage for 18 weeks.

Further determinations of specialisation in flax rust caused by *Melampsora lini* (Pers.) Lév., W. L. WATERHOUSE and I. A. WATSON. (*Roy. Soc. N. S. Wales, Jour. and Proc.*, 77 (1944), pt. 4, pp. 138-144).—Determinations of rusted fiber and linseed flax from Australia and New Zealand revealed the occurrence of six

physiological races. Four of them attack fiber flax and exhibit resemblances to each other and to Flor's U. S. A. race 21; the other two differ markedly and attack the linseed varieties. The Australian distribution of these races is recorded. Initial studies on the genetics of one race indicate it to be homozygous. The native flax *Linum marginale* plays an important role as perennial host to the rust fungus; to date, three of the races have been isolated from it. A classification of many varieties is made on the basis of their reactions to rust.

Mosaic, a new oats disease (*Res. and Farming [North Carolina Sta.]*, 3 (1944), *Prog. Rpt. 4*, pp. 51-52).—This new disease of unknown cause is reported from several Southern States, including North Carolina. Evidences of varietal differences in resistance were observed.

Pythium root necrosis of oats, A. WELCH. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 4, pp. 361-399, *illus. 10*).—*P. debaryanum* caused serious root necrosis on oats grown in Iowa during 1938-42; isolation from field-grown plants revealed it to be the predominating organism in affected roots during the early part of the season, but it was not isolated after June 25 in the many attempts made during three of the above years. Greenhouse tests disclosed this fungus to be capable of causing a serious seed rot and root necrosis at and below 25° C.; it was especially aggressive at 8°-15°. In artificially infested soil, the temperature, size and age of seed, and amount of inoculum were important in determining the severity of attack. Among 232 oats varieties grown in such soil, Coast Black, Black Algerian, Early Red Rustproof, Red Algerian, Ruakura, and Flughafer proved most resistant, though none were outstandingly so. Commercial varieties and wild species having 21 pairs of chromosomes proved more resistant than those with 14 and 12 pairs. Plants grown in infested soil had reduced growth rates and delayed tillering; the oven-dry weight of such plants was about half that of plants grown in non-infested soil, and the yield of Swedish Select was also reduced about half. The prevalence of *Pythium* on the roots of yellow and green field plants depended on the time of the isolations; made in spring when the yellowing was first observed, the plants tended to give the highest percentage of *Pythium*. Roots of the yellow plants were rotted more rapidly than those of green plants and secondary organisms entered quickly. *Pythium* was isolated from green plants at a later date than from the yellow ones. Nutritional deficiencies increased the damaging effects of pythium root necrosis. Heavy applications of NaNO₃ or a 6-8-12 fertilizer prevented field-grown plants from becoming stunted and chlorotic, rendering it possible for new roots to replace those badly parasitized; since the rate of replacement was high, these plants continued to grow vigorously and appeared normal, although no increase in resistance was involved. It was noted throughout the study that any factor retarding plant growth made the pythium injury more pronounced but failed noticeably to affect the pathogenicity. Plants grown under optimum temperature, moisture, humidity, etc., continued apparently normal either with or without *P. debaryanum*, but if any factor became limiting to optimum development the fungus seemingly became more destructive.

Black scurf and stem canker of potato (*Corticium solani* Bourd. & Galz.): Further field studies on the use of clean and contaminated seed potatoes and on the contamination of crop tubers, T. SMALL (*Ann. Appl. Biol.*, 32 (1945), No. 3, pp. 206-209).—In continuation (E. S. R., 90, p. 777), field trials with contaminated soil showed black-scurf contamination to be prevalent on crops grown from clean seed and to differ insignificantly from that on plots planted with contaminated seed. It was severe on early harvested tubers but more so on the late harvested crop. Produce grown with and without stable manure was heavily contaminated. Infested seed caused a check in tuber formation and an appreciable increase in stem canker and in number primary shoots killed. Nevertheless, the yields from manured con-

taminated-seed plots were satisfactory and no lower than those from the clean-seed plots. There appeared to be no relation between yield and amount of black scurf on the produce. The results of a trial in a field in grass for at least 43 yr. suggested that the soil contained little if any of the fungus. Heavy contamination occurred on tubers grown under relatively dry soil conditions. In all the trials, misses and wilted shoots caused by *Corticium* were rare and there was no premature yellowing or death of the haulms on the clean or contaminated seed plots. The evidence obtained during 1941-44 indicated that in England satisfactory yields of early main crop varieties may be obtained despite the prevalence of *C. solani* in the soil and on the seed, provided the soil and culture conditions are reasonably good.

Transmission and spread of late blight in seed potatoes, A. H. EDDINS. (Fla. Expt. Sta.). (*Amer. Potato Jour.*, 22 (1945), No. 11, pp. 333-339, *illus.* 2).—The findings reported reveal that infection by *Phytophthora infestans* spreads from diseased to healthy tubers in seed bags under certain conditions in Florida. The greatest increase occurred under storage in the open when the tubers remained wet for prolonged periods of rainy weather or when they were kept in continuous shade where they dried slowly after rains. There was no spread in bags kept dry. It proved impossible to predict the occurrence of late blight in the field in Florida even when infected seed was planted; most of the diseased seed usually rotted without sprouting or produced weak sprouts which soon died or formed small low-yielding plants. It is concluded that infected tubers in seed potatoes are the primary source of the disease in Florida. If the seed tubers are dug after the tops have matured and died or have been killed by frost or herbicides before shipment to Florida, there should be little transmission and spread of late blight from that source, particularly if the tubers are kept dry from harvesting to planting.

Physiological internal necrosis of potato tubers in Wisconsin, R. H. LARSON and A. R. ALBERT. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 71 (1945), No. 11, pp. 487-505, *illus.* 5).—This trouble is said to be very important in the large commercial late potato producing area involving the lighter soils of central Wisconsin, in many instances being a limiting factor in the production of marketable crops. Affected tubers are not detected until cut in the final culinary stage, in the dicing stage in dehydration, or as sliced in potato chip manufacture. This internal necrosis increases both in amount and severity as the season advances, and tubers with 2 in. or more of soil over them are very much less affected than those more lightly covered. The fact that the amount and degree of internal necrosis is much more severe in the larger and older tubers indicates that its inception is during initial tuber development and that it increases during growth. There was no increase in the incidence of necrosis during storage. The most resistant varieties were Triumph, Houma, Pontiac, and Red Warba; Rural New Yorker, Katahdin, Russet Rural, and Harmony Beauty were most susceptible. Straw mulch consistently reduced internal tuber necrosis. On the other hand, applications of hydrated lime, sulfur, combinations of macroelements in the form of N, P, and K, microelements as soluble salts of B, Cu, Fe, Mg, Mn, and Zn alone or incorporated in a complete fertilizer, and borax alone all failed to reduce the incidence of internal necrosis. There was, however, a larger percentage of tubers with the severe-type internal necrosis in the higher alkaline treatments. The evidence denotes that in lighter soils the fluctuating factors of soil temperature and moisture (a lack of proper water balance causing respiratory disturbances within the tubers during their early formation) play a more important role in the occurrence and severity of internal tuber necrosis than differences in organic-matter content, soil reaction, or soil fertility.

The cause of purple-top of potatoes, as indicated by a study of its distribution within fields, G. BEALL and F. M. CANNON (*Amer. Potato Jour.*, 22 (1945), No. 12, pp. 362-372, illus. 2).—From a statistical study of the distribution of purple top within tuber-unit plantings it is clear to the authors that the cause may operate variously over a field but with similar freedom along and across rows of potatoes. Furthermore, there was no tendency for one plant to be infected because a comember of a tuber unit had the malady. There was an uncertain suggestion, to the contrary, that a regular proportion of the plants in each tuber unit tend to purple top, as might be expected if the mother tuber for each unit were involved. The general conclusion is that purple top cannot be simply contagious from a plant to its neighbor or be inherited. The possible relation of a type of purple top to a strain of the aster yellows virus is discussed in a footnote.

Resistance in potato varieties to yellow dwarf, R. H. LARSON. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 10, pp. 441-451, illus. 2).—Yellow dwarf is an important factor for production in certain Wisconsin areas where the virus commonly builds up rapidly in spite of increased plantings of disease-free seed. Russet Burbank, Warba, and Sebago potatoes have shown a high degree of field resistance under conditions of extensive spread, as indicated by a low percentage both of visibly infected and of nonemerging hills. These varieties when infected also exhibit little if any tuber malformation or internal necrotic flecking. In the field, the clover leafhopper vector (*Aceratagallia sanguinolenta* (Prov.)) was found as numerous on resistant as on susceptible varieties. No difference was observed in its feeding habits or location of feeding on the varieties under greenhouse culture tests. The chances of infecting certain Sebago plants are very much less than those of infecting Green Mountain or Russet Rural. A high incidence of the disease can be most effectively reduced by use of resistant varieties.

Control of the potato-root eelworm, *Heterodera rostochiensis* Wollenweber, by allyl isothiocyanate, the mustard oil of *Brassica nigra* L., C. ELLENBY (*Ann Appl. Biol.*, 32 (1945), No. 3, pp. 237-239).—Previous work (E. S. R., 93, p. 451) revealed that in the presence of root excretions of certain crucifers or of dilute solutions of allyl isothiocyanate the larvae failed to emerge from the cysts when stimulated by potato-root excretions. The present paper describes a small-scale field trial in which this mustard oil was applied with peat to the drills at time of planting; an increase in the potato yield of about 100 percent resulted from a dressing of the oil equivalent to 0.1 cwt. per acre.

Artificial production of ergot in the tropical plains of Bengal, J. C. SAHA and S. K. BHATTACHARJEE (*Nature [London]*, 156 (1945), No. 3960, pp. 363-364, illus. 1).—A very good quality ergot is said to have been easily produced in the plains of the Tropics by artificial spraying of rye flowers with the ergot fungus spores.

The parasitism of *Striga hermonthica* Benth. on *Sorghum* spp. under irrigation.—I, Preliminary results and the effect of heavy and light irrigation on *Striga* attack, F. W. ANDREWS (*Ann. Appl. Biol.*, 32 (1945), No. 3, pp. 193-200, illus. 1).—From studies in the Anglo-Egyptian Sudan it was learned that the greater majority of the seeds of this parasitic plant (witchweed) can be germinated only in the presence of excretions from the roots of certain plants not all of which can serve as its hosts, but unless it becomes attached to a host plant the seedling dies. Thus the growing of plants whose roots can stimulate germination of *Striga* seeds but cannot be parasitized may provide a means of ridding infested land of this pest. Green ovaries picked from flowering plants produced viable seeds if left to dry. In the field *Striga* seeds are distributed in the soil to a depth of at least 15 in.; when the seeds are evenly distributed through the soil, the number of *Striga* seedlings attached to a sorghum plant is proportional to the root's development. The size of sorghum seed has no effect on the root size of a sorghum plant and consequently

none on the degree of parasitism. The effect of severe attack on sorghum is to produce a reduction of about 60 percent in root and leaf weights. No reduction in attack was obtained when various micro-elements were coated on the sorghum seeds before sowing. Field and laboratory experiments indicated that light irrigation of the crop during the normal sowing period increases the *Striga* attack, and heavy irrigation decreases it. *Striga* attack was lessened when conditions favoring growth of the sorghum crop were improved.

Elektronenmikroskopische Bestimmung der Konzentration von Tabakmosaik-viruslösungen [Electron microscope determination of the concentration of tobacco mosaic virus solutions], H. HAARDICK, G. A. KAUSCHE, and H. RUSKA (*Naturwissenschaften*, 32 (1944), No. 27-39, pp. 226-228, illus. 3).

The relationship between American tobacco streak and Brazilian "necrose branca" or "couve," A. S. COSTA (*Phytopathology*, 35 (1945), No. 12, pp. 1029-1030, illus. 1).—The relationship between these virus diseases has been indicated in earlier reports. The probability of this relationship is further strengthened by an unusual floral symptom each disease exhibits in the chronic stage—the petals ending in a filamentlike appendage.

A new species of *Colletotrichum* on vetch, J. L. WEIMER. (U. S. D. A. coop. Ga. Expt. Sta.). (*Phytopathology*, 35 (1945), No. 12, pp. 977-990, illus. 4).—*C. villosum* n. sp.—cause of an anthracnose of vetches—is described. On the leaves the fungus produces small circular spots, at first light green but later becoming light brown or gray with a brown-to-red border; the stem lesions are linear and usually dark to black. Severe defoliation and death of young stems may occur during wet weather. The pathogen grows slowly on nonacid media and fruits abundantly on sterilized fresh stringbean pods, as well as on potato-dextrose, corn-meal, and oat-meal agars. The optimum temperature for growth lies between 24° and 26° C., some growth takes place at 3.5°, and the maximum for survival is near 32°. *Vicia atropurpurea*, *V. villosum*, and *V. dasycarpa* are the most susceptible of the species tested; most strains of *V. sativa*, *V. grandiflora*, *V. monanthos*, *V. angustifolia*, and *V. pannonica* are fairly resistant. Use of disease-free seed, rotation, and resistant varieties is suggested for control.

The pH stability of southern bean mosaic virus, W. C. PRICE (*Arch. Biochem.*, 8 (1945), No. 1, pp. 13-19).—The pH stability range of southern bean mosaic virus (*Marmor laesiofaciens*) was determined for clarified juice samples at 3° and for purified virus at 3° and at 27° C. Little or no difference was found for the stability of the virus in clarified v. purified preparations of the juice, but the pH stability range was much narrower at 27° than at 3°. The virus was relatively stable at 27° for 7 days at pH 5.0 to 6.7 and at 3° for 37 days at pH 4.0 to 8.0. The pH of maximum stability (5.2 to 6.9) failed to coincide with the pH of maximum infectivity—pH 6.2 to 7.9.

Effect of air temperature on the concentration of certain viruses in cabbage, G. S. POUND and J. C. WALKER. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 11, pp. 471-485, illus. 1).—These quantitative studies were made to determine the effect of air temperature and day length on the concentration of cabbage virus A and cabbage black ring virus (both strains of turnip virus 1) and of cabbage virus B—a strain of cauliflower virus 1—in cabbage plants. The concentration of the first two was significantly greater in plants grown at 28° C. than in those grown at 16°, both when either of them occurred alone or along with cabbage virus B. When plants were infected with virus A or with A and B together, incubated at 22°, and later moved to 16° and 28°, respectively, the concentration at 16° fell significantly below that at 28°. When plants were inoculated with virus A and kept at 5° for 60 days, the systemic build-up of the virus was practically nil. When such plants were moved to 28° for 30 days the concentration rose until it

was not significantly different from that of plants inoculated at the same time and kept continuously at 28°. No significant difference was found between the concentration of virus A in plants infected alone and that in plants infected with both A and B. It is suggested that the increased severity of symptoms of viruses A and B together over that of either one alone results from the additive effect of each virus on the metabolism of the plant. The concentration of virus A in field plants at Madison, Wis., declined progressively as plants grew into increasingly cool temperatures in the fall. Length of day had no effect on virus concentration. Virus B was shown to occur in greater amounts in plants grown at 16° than in those grown at 28°, although the method of measurement with this virus was less accurate.

Systemic invasion of cabbage seedlings by the downy mildew fungus, F. J. LeBEAU. (Miss. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 10, pp. 453-463, illus. 3).—The author reports in detail the results of his studies of the epidemiology and parasitism of the downy mildew fungus (*Peronospora parasitica*) on cabbage seedlings. The young plants became systemically invaded after infection of the hypocotyl and cotyledons; development of the mycelium was confined to these tissues, failing to pass through the cotyledonary node to invade the true stem. Invasion of the true leaves remained localized about the point of infection. Oospores proved to be the chief source of primary inoculum for initiating epidemics in Mississippi seedbeds. The relation of these results to interpreting the development of epidemics of cabbage mildew in seedbeds of this State is discussed.

A new yellows disease of carrots, L. O. KUNKEL (*Jour. Bact.*, 50 (1945), No. 2, p. 238).—An abstract.

Gray mold of lettuce controlled with Thiosan, J. S. NIEDERHAUSER. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, p. 10, illus. 1).—In the experiments reported, almost complete control of this serious cold-frame and greenhouse disease was obtained, early treatment proving most effective.

Experiments on the control of white rot (*Sclerotium cepivorum* Berk.) in onions, J. R. BOOER (*Ann. Appl. Biol.*, 32 (1945), No. 3, pp. 210-213, illus. 1).—In trials during 1943-44, application of 4 percent calomel dust to the seed furrow at spring sowing time gave better results than treating the seed itself; 1 lb. of dust per 25 yd. of seed furrow gave good control in bulb onions and 1 lb. per 50 yd. may suffice for salad onions. The relation between disease control and the effective mercury content of the treated soil is discussed.

The influence of date of lifting and method of storing on loss of onion bulbs harvested in 1943, E. R. WALLACE and C. J. HICKMAN (*Ann. Appl. Biol.*, 32 (1945), No. 3, pp. 200-205, illus. 1).—Date-of-lifting trials with four onion varieties at two centers were examined in relation to the incidence of losses in storage, and at one center the effects of indoor and outdoor storage are compared. Losses due to *Botrytis*, nematode infestation, and sprouting are considered in detail, and the significance of the findings is discussed.

Some pea diseases quite general during 1945 season, W. T. SCHROEDER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, pp. 14-15).—Pea diseases are said to have been very much in evidence in New York State during 1945, though a survey revealed that the yields were not necessarily reduced in proportion to the amounts present. The point is stressed, however, that both soil and vines may serve as sources of early disease development in 1946.

Black pox, an apple fruit and bark disease (New Jersey Stas. Plant Disease Notes, 22 (1945), No. 10, pp. 37-40).—This disease—observed on Grimes Golden, Golden Delicious, and Rome Beauty apples in south and central New Jersey (1945)—was identified as the helminthosporium black pit originally described from West

Virginia (E. S. R., 71, p. 800). Since locally the disease has been observed in abundance only on old trees of low vigor, it is suggested that affected trees be returned to a vigorous growing condition through such means as proper fertilization and cultivation.

Status of peach mosaic project, R. G. RICHMOND. (U. S. D. A.). (*Calif. Dept. Agr. Spec. Pub.* 209 [1945], pp. 49-54).

A line-pattern virosis of Shiro plum, R. S. WILLISON (*Phytopathology*, 35 (1945), No. 12, pp. 991-1001, illus. 3).—This virus disease is characterized by linear markings, such as rings, lines, bands, oak leaf patterns, and vein-banding of different intensities on most of the species and varieties of *Prunus* to which it has been transmitted. Symptoms appear only on leaves produced in the spring or early summer and are most plentiful when cool weather prevails. Of the plum varieties tested, Early Golden and Imperial Gage were virtually symptomless, while First, Italian prune, and Reine Claude exhibited only slight symptoms. On German prune, Lombard, and Abundance, the patterns were well-defined, though less brilliant than on Shiro. Myrobalan seedlings also varied in intensity of symptom expression, but peach varieties were fairly uniform, reacting moderately to the virus. On sweet cherries, irregular yellow or white lines, and, on sour cherries, translucent lines were diagnostic. *P. mahaleb* seedlings responded both with green lines and rings and with short yellow streaks along larger veins.

"Lambert mottle," a transmissible disease of sweet cherry, T. B. LOTT (*Sci. Agr.*, 25 (1945), No. 12, pp. 776-779, illus. 5).—The new disease described is known to produce symptoms only on the Lambert variety; it has occurred spontaneously—both alone and associated with mottle leaf—but is rare. Transmission attempts by graft or shield budding have in all cases been successful. Pronounced symptoms were produced by Lambert mottle on Lambert trees and by mottle leaf on Bing and Napoleon trees, but there was little or no visible effect of Lambert mottle on Bing or Napoleon or of mottle leaf on Lambert trees. When both diseases were present together the symptoms depended on the variety of the tree and only one disease was visible, the other having no apparent effect.

Rusty mottle of the sweet cherry in Utah, B. L. RICHARDS and A. S. RHOADS. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 3, pp. 6-8, 11, illus. 4).—What appeared to be a new virus disease of sweet cherry when first observed (1943) in Davis County has been shown by further studies to be identical in many if not all respects with rusty mottle. It has become firmly established in Utah orchards and has probably been present for at least 10 yr.; its incidence and percentage in the four counties where known to occur are tabulated. All varieties of sweet cherries grown in Washington are affected. It is caused by a systemic virus for which there is no known cure; removal of affected trees is the only means of eradication. Trees from nurserymen unable to certify their stock as free of rusty mottle and other virus diseases should not be accepted. In 1944, buds from rusty mottle trees were grafted into peach, western chokecherry, and sour cherry; to date, symptoms—described—have been produced only in the sour cherry. Some evidence of symptomless carriers has been obtained.

Inoculation experiments with *Pseudomonas ribicola*, G. W. BOHN and J. C. MALOTT. (U. S. D. A.). (*Phytopathology*, 35 (1945), No. 12, pp. 1008-1016, illus. 1).—Ordinary spray inoculations on *Ribes aureum* yielded very few infection spots or none; needle punctures gave moderate numbers of spots with perforated centers; forced spray inoculations resulted in large infected areas and extreme distortion unlike spots resulting from spontaneous infections. These findings and those from forced spray inoculations on immune host plants suggested that the methods used fail to yield a reliable index of pathogenicity. Applications of bacterial suspension with cotton and cheesecloth pads on leaves dusted with 300-mesh carborundum

yielded excellent infections with numerous spots like those in spontaneous infections. Application of suspensions with pads or lacquer brushes on nondusted leaves yielded good infections with typical spots. Observations on the results of inoculation experiments and on spontaneous infections and the weather indicated *P. ribicola* to be a wound parasite. The carborundum dust-cotton pad and brush technics are recommended for trial with other wound-parasitic bacteria and mold fungi—particularly on hosts with hard thickly cutinized leaves and where control of relative humidity is difficult.

The parasitism of *Glomerularia loniceræ* (PK.) D. and H. in *Lonicera* species, C. J. GOULD, JR. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 4, pp. 301–331, illus. 49).—*Herpobasidium deformans* n. sp. is described as the cause of honeysuckle leaf blight, hitherto ascribed to *G. loniceræ*; the latter appears to be the imperfect stage of the fungus since it is commonly associated with the disease, and—although lack of infection has followed conidial inoculation and the basidia have not been grown in artificial culture—the binucleate mycelium of both spore stages and the fact that cultures from platings of single basidiospores, basidiospore masses, conidia, and fragments of infected leaves all produced the conidial stages would also seem to indicate that all are stages of the same life cycle. The disease appears in the spring on early leaves, and secondary infections usually follow during the rest of the year; affected leaves are brownish-black and often rolled and twisted. The host range was extended to include 33 species and varieties of *Lonicera* and the related *Symphoricarpos albus*. The disease occurs in the northeastern and north-central parts of the United States and adjacent Canadian and Newfoundland areas. The pathogen was cultured on artificial media by platings from basidiospores, conidia, or infected leaf fragments; its culture characters and physiology are described. Conditions favoring infection were temperatures of 15°–18° C., relative humidities near 100 percent, sustained periods of high humidity, and use of young leaves and of lower leaf surfaces. Minimum and maximum temperatures for infection were approximately 1° and 24°–28°. Varieties exhibited considerable differences in susceptibility; *L. japonica halliana* appeared to be immune. There are 22 references.

Some preliminary tests to determine the efficacy of certain substances when used as soil fumigants to control the root-knot nematode, *Heterodera marioni* (Cornu) Goodey, J. R. CHRISTIE (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 12 (1945), No. 1, pp. 14–19, illus. 1).—In the tests reported, the effects of single and mixed fumigants on inoculum placed at varying intervals from the point of injection is expressed in terms of the amount of gall production on the roots of indicator plants; the results are discussed and tabulated. Larvacide (chloropicrin) proved more satisfactory when infested roots had decayed; with DD and Dowfume G this factor did not seem so important. Though the killing range of DD varied slightly from test to test, this did not appear correlated with variations in soil temperature or moisture. Ethylene dibromide had a killing range (to 12 but not to 15 in.) as great as any material tried; for 1,1,2-trichlorethane, the range was to 3 but not to 6 in. Except for these five materials, the tests failed to reveal any chemicals—alone or in combination—possessing appreciable killing power.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Soil, forest, and wildlife restoration in the farm program, E. L. LE'COMPTE (*Baltimore 2: Md. State Game and Inland Fish Comm.*, 1945, 3. ed., pp. 51, several illus.). The author has "prepared this bulletin with the hope that it will be of assistance to landowners, farmers, sportsmen, and all others in Maryland who are interested in making the farming sections more attractive to wildlife." It is felt

that if the suggestions presented are applied diligently the result will be a material increase not only in the saving of the soil but also of the valuable wildlife.

The mammals of Minnesota, G. SWANSON, T. SURBER, and T. S. ROBERTS (*Minn. Dept. Conserv. Tech. Bul. 2* (1945), pp. 108, illus. 29).—This "cooperative undertaking" contains the following sections: The Vanished Mammals of Minnesota—A Retrospect, by T. S. Roberts (pp. 7-19); Minnesota's Fossil Mammals (pp. 20-21), Conservation of Minnesota Mammals (pp. 44-45), Economic Value of Minnesota Mammals (pp. 46-49), Collecting Mammals (pp. 50-51), and A Systematic Catalog of the Mammals of Minnesota (pp. 52-105), all by G. Swanson; and Big Game Mammals of Minnesota (pp. 22-28), The Fur Bearers (pp. 29-33), The Rodents or Gnawers (pp. 34-39), and Insectivorous Mammals (pp. 40-43), all by T. Surber. C. S. Wilson says in the foreword that "we feel that a happy combination has been achieved to fill the crying need for more accurate information on our mammals and their proper management." The systematic catalog—meant for technical reference—summarizes briefly the status of each mammal found in the State, very often pointing out that it is still a fertile field for the study of mammals since as yet only a start has been made. A subject index is included for the bulletin as a whole.

The Vermont deer herd: A study in productivity, L. E. FOOTE (*Vt. Fish and Game Serv., Pittman-Robertson Ser. No. 13* (1945), pp. 125, illus. 50).—This monographic investigation of the white-tailed deer (*Odocoileus virginianus borealis*) in Vermont includes chapters on its history, populations, relations to physiography, weather, and land use, its value, and the damage which it causes. Changes in the land-use pattern are believed the most important factors in its decline in numbers since colonial times and in the subsequent increase in the herd. The present population is estimated at 45,000-50,000 deer, with a sex ratio of 1:1.6 in favor of the ♀♀; the factors influencing populations are discussed. Weights and measurements taken in eight counties indicate age to be the most important single factor governing size and weight; deer in Windham County are smaller because they are younger. Weather affects both daily and seasonal deer kills; e. g., excessive snowfalls and warmer seasons result in decreases. Decline of lands in farms and reversion of cut-over and once agricultural areas have resulted in better deer range and more of it. Vermont winter range is approaching its carrying capacity, and the stage is set for a problem in deer numbers. Damage by deer presents a difficult problem and an attempt at control is justified; the question is how to accomplish it most economically. Of the injuries to many crops, that in orchards is at once the most severe and the most difficult to control. Electric fences, blood meal, and various other substances have been used for effective control, but additional experimentation is necessary. The value of the Vermont deer is estimated to be over 8 million dollars; in aesthetic value it is undoubtedly worth more. Wise management in the next decade is considered a necessity, and research must be pointed toward studies on winter range, control of damage, and improved education of the public. A definite deer management policy is said to have been forming over the last decade—a policy believed sound in every respect. There are 64 references.

Fox squirrels and gray squirrels in Illinois, L. G. BROWN and L. E. YEAGER (*Ill. Nat. Hist. Survey Bul., 23* (1945), Art. 5, pp. 449-536+, illus. 43).—This investigation was initiated in furtherance of biologically sound squirrel hunting seasons and progressive squirrel management in the State. The report covers studies over a 4-yr. period and includes data on population, species competition, daily activity, seasonal movements, condition, parasites and diseases, predation, breeding, rearing of young, Illinois habitats, foods and feeding, nesting, hunting, and management. There are 72 references.

Epidemiological significance of seasonal variations in rodent-ectoparasite distribution, A. S. RUMREICH and J. A. KOEPKE (*Pub. Health Rpts. [U. S.]*, 60

(1945), No. 48, pp. 1421-1428, illus. 2).—In the light of the known infectibility of the oriental rat flea, along with the field survey findings here reported, this common ectoparasite of the commensal rats may be accepted as at least an important vector of endemic typhus in Jacksonville, Fla., and as the principal vector in Mobile, Ala. The available evidence is considered inadequate, however, to support any assumption that this flea plays an equivalent role in Honolulu. On the other hand, the suggestive correspondence to statistically significant correlation of the parasitid mite *Laelaps hawaiiensis* with typhus cannot be considered as evidence of any transmission role, since the only known observations on it have been limited to taxonomic studies of killed specimens. Incrimination of this mite as a vector in some localities or during certain periods would be contingent on demonstrating its infectibility either in nature or under experimental conditions.

Modern bird study, L. GRISCOM (*Cambridge: Harvard Univ. Press; London: Oxford Univ. Press, 1945, pp. 190+*, illus. 25).—The main object of this book—the outgrowth of a course of lectures—“is to show that the study of birds is not only a branch of scientific research . . . but that it also contains many topics of interest to the layman.” Topics considered are the development of field ornithology; the capacity, intelligence, and adaptability of birds; the causes, origin, factors, and routes of migration; the general and South, Central, and North American distributions of birds; and classification and the species concept.

The aquatic and marsh vegetation of Minnesota and its value to waterfowl, J. B. MOYLE and N. HOTCHKISS (*Minn. Dept. Conserv. Tech. Bul. 3 (1945), pp. 122+*, illus. 60).—According to a foreword by L. L. Smith, Jr., this bulletin was prepared on requests from sportsmen, fisheries biologists, and wildlife technicians for information on the identification, ecology, and propagation of aquatic plants. In addition to discussions of utilization, planting, control, and factors determining the distribution of aquatic plants, a Minnesota check list, a key based on vegetative characteristics, and a glossary of terms are included. Sections are also devoted to the Minnesota lakes, of which there are 10,000, and to waterfowl in relation to agriculture.

The migration of Swainson's and broad-winged hawks through Costa Rica, A. F. SKUTCH. (Wash. State Col.). (*Northwest Sci.*, 19 (1945), No. 4, pp. 80-89).

The ring-necked pheasant and its management in North America, edited by W. L. McATEE (*Washington, D. C.: Amer. Wildlife Inst., 1945, pp. 320+*, illus. 43).—“The foundation of this book is a report on the ecology, life equation, and management of the ring-necked pheasant in Ohio. Supplementary are chapters relating to several other important centers of pheasant distribution and one on artificial propagation of the bird. All of these have been prepared by employees of the Federal Fish and Wildlife Service and are largely products of the Cooperative Wildlife Research Units, jointly sponsored by that Service, certain land-grant colleges, the respective State conservation departments, and the American Wildlife Institute. An introduction and a chapter on classification and distribution are by other authors [F. C. Walcott and J. Delacour, respectively].”

Helminths from the bob-white quail in Texas, J. D. WEBSTER and C. J. ADDIS (*Jour. Parasitol.*, 31 (1945), No. 4, pp. 286-287).—A note on the cestodes and nematodes found.

A biological survey and fishery management plan for the streams of the Lake Superior North Shore Watershed, L. L. SMITH, JR., and J. B. MOYLE (*Minn. Dept. Conserv. Tech. Bul. 1 (1944), pp. 228+*, illus. 40).—The streams of the North Shore comprise a natural fish management unit of 2,400 sq. miles; their increased use, change of natural conditions on the watershed, and poor fishing returns have made the need for a complete and thorough fisheries management program apparent. This monographic survey considers previous investigations (over nine pages of references); the organization of the survey and the methods used; the geology,

topography, and history of the watershed; past and present management policies; descriptions of the 30 streams of the watershed; fishes of the streams of the North Shore, with annotated list; chemical quality of the trout-stream waters of the area; plant and animal plankton and the bottom-inhabiting algae of the streams; the larger aquatic plants; bottom fauna of the streams; and stream improvement of the North Shore watershed. An appendix gives detailed stocking recommendations and stream data by stations.

A copepod parasite of the cisco from Trout Lake, Wisconsin, W. M. TMD and R. V. BANGHAM. (Ohio State Univ.). (*Ohio Jour. Sci.*, 45 (1945), No. 2, pp. 82-84, illus. 7.).—The parasite of this food fish is described as *Salmincola wisconsinensis* n. sp.

[Papers on economic zoology and entomology] (*Pests*, 13 (1945), No. 11, pp. 22-28).—The following are included: DDT—Toxicology, by A. L. Davison (pp. 22, 24); Some Effective Poison Formulas in Rodent (Rats and Mice) Control, by R. M. Borg (pp. 24, 26) (Mass. State Col.); Diseases Transmitted From Rats to Man (Abstract), by V. T. Schuhardt (p. 26); and The Use of DDT in the Control of Stored Product Pests, by H. E. Gray (p. 28).

Some early entomological ideas and practices in America, H. B. WEISS (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 4, pp. 301-308).—The examples presented—drawn from various records—are cited as expressions of entomological thought and suggestion of earlier years.

Insects of the Pacific World, C. H. CURRAN (*New York: Macmillan Co.*, 1945, pp. 317+, illus. 97).—"This book is one of a series describing the natural history and peoples of the Pacific Ocean and of its innumerable islands, large and small."

Insect problems of Peru's Sierra, P. KNIGHT (*U. S. Dept. Agr., Agr. in Americas*, 5 (1945), No. 11, pp. 207-209, illus. 3).—The author believes that as new areas of Peru are opened problems of insect control will increase. Cotton, sugarcane, and potatoes have been important large-scale crops but many other plants are grown on a smaller scale. Control practices for insect pests may be necessary for any of these crops as well as for insects attacking livestock.

Proceedings of the twenty-fourth and twenty-fifth annual conferences, Western Plant Board (*Calif. Dept. Agr. Spec. Pub.* 209 [1945], pp. 126, illus. 3).—The following papers, with discussions, are included: Potential Significance of *Sitona lineata*, by F. E. DeSellem (pp. 28-30); Potato Tuber Moth, With Special Reference to Its Quarantine Aspects, by D. B. Mackie (pp. 36-43); Pear Psylla Control Program in the Pacific Northwest, by L. G. Davis (pp. 44-48) (U. S. D. A.); Investigations to Determine the Validity of the Species *Rhagoletis indifferens* Curran Infesting the Wild Bitter Cherry *Prunus emarginata* in Cherry Fruit Fly-Free Areas, by S. C. Jones (pp. 55-59) (Oreg. Expt. Sta.); The Oriental Fruit Moth in Relation to Dormant Nursery Stock, by G. J. Haeussler (pp. 92-103) (U. S. D. A.); The Oriental Fruit Moth Quarantines in the Light of "Principles of Plant Quarantine," by L. M. Gates (pp. 104-105); Recently Questioned Requirements of Oriental Fruit Moth Quarantines, by J. L. E. Lauderdale (pp. 107-112); Recent Investigations on the Cherry Fruit Fly, by S. C. Jones (pp. 116-117) (Oreg. State Col.); and Federal Problems, by P. N. Annand (pp. 117-119), and Status of White-Fringed Beetle, by B. M. Gaddis (pp. 120-121) (both U. S. D. A.).

A laboratory method for determining the minimum active temperatures of insects, W. G. WELLINGTON (*Canad. Ent.*, 77 (1945), No. 7, pp. 135-136).—The field method usually employed involves continued observations on the relative abundance of species, correlated to some degree with observations on the air temperatures at the time of abundant flight; this is apt to produce a collection of temperature ranges rather than exact temperatures. In its simplest form the author's method requires at least two mercury air temperature thermometers and some form of cold chamber

of such design that it can be opened to outside air with minimum warming of the interior. By the technic described, it was found possible to determine the temperatures at which antennal, leg, and wing movements first occur.

Neuropathology in insects. A. G. RICHARDS, JR., and L. K. CUTKOMP (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 4, pp. 313-355, illus. 18).—Findings are presented on the histopathological effects on cockroaches and mosquito larvae of acute doses of various materials, including pyrethrum, "Thanite," petroleum oils, venoms, triorthocresol, cresyl phosphate, lipid solvents, insect repellents, aniline, essential oils, "Valone," acidity, and a number of highly destructive compounds of which octyl alcohol is an example. No visible effects were obtained with DDT and certain other compounds. Optical analysis, routine stained sections, and in vitro analyses were used; electrical stimulation of the nerve cords was employed to determine the physiological state of the nerves being studied. The various types of pathological pictures can be described by such terms as decrease or loss of one or more of the components of the optical properties, granularity, chromatin clumping in the nuclei, and various stages of cell dissolution. The physiological and histological effects of pyrethrum are considered in some detail. Lipid solvents as fluids in considerable quantity removed the lipid component of the sheath birefringence; used as vapors, they killed without visible effects. The effects of insect repellents were comparable to those of the lipid solvents. In all cases studied—with the possible exception of chromatin clumping—nerves were paralyzed and presumably dead prior to the appearance of any abnormalities or lesions. It is believed that the histopathology of insect nerves is at best a crude test and likely to be misleading as a measure of physiological effects on insects. The term "nerve poison" is a rather vague concept—convenient but not specific. The analysis of insecticide action on nerves requires more specific technics than histopathology and the demonstration of paralysis. The suggestion that lysolecithin formed by the breakdown of nerve sheath lipids may be concerned in insect paralysis is discredited. Certain substances highly toxic to vertebrates proved to have little or no effect on cockroaches (e. g., cobra venom, histamine, curare). There are nearly three pages of references.

The nature of the sex attractant of the female gypsy moth. H. L. HALLER, F. ACREE, JR., and S. F. POTTS. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 10, pp. 1659-1662).—Benzene extractives prepared from the abdominal tips of virgin female gypsy moths were attractive to males. The attractiveness was markedly increased by hydrogenation. The attractant remained in the neutral fraction after saponification, and it reacted with phthalic anhydride. It was recovered from the phthalic acid ester by saponification. The attractant was specific for the male gypsy moth. None of several synthetic materials tested showed any attractiveness.

New insect-control methods studied. C. E. PALM. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, p. 16.—A practical account.

Quarterly bibliography of insecticide materials of vegetable origin. No. 30 (January to March 1945), R. M. JOHNSON (*Bul. Imp. Inst. [London]*, 43 (1945), No. 2, pp. 101-105).—A continuation of this bibliography (E. S. R., 93, p. 600).

Insecticide toxicity studies: Experimental results on the comparative toxicity of benzene hexachloride, DDT, and pyrethrum. W. A. GERSDORFF and E. R. MCGOVAN. (U. S. D. A.). (*Soap and Sanit. Chem.*, 21 (1945), No. 11, pp. 117, 121, illus. 1).—The results of tests against houseflies indicated that at the 50-percent mortality level *p,p'*-DDT was about twice and gamma benzene hexachloride about 18 times as toxic as the standard pyrethrins when used in deodorized kerosene sprays by the turntable method. Further details of the tests are discussed and tabulated.

Antioxidants for pyrethrum powders. R. C. BUSHLAND, M. S. SCHECHTER, H. A. JONES, and E. F. KNIPLING. (U. S. D. A.). (*Soap and Sanit. Chem.*, 21 (1945),

No. 11, pp. 119, 121).—In the development of a louse powder for use by the armed forces, it was determined that a pyrethrum concentrate or extract deposited on a diluent such as pyrophyllite to give a dust containing 1 percent total pyrethrins the resulting powder gives excellent results against lice; because of the rapid deterioration of the pyrethrins, however, it became necessary to incorporate an antioxidant. Among the materials tested, phenol S was selected as the one to recommend from the standpoints of effectiveness and lack of toxic effects to man; pyrogallol, alpha-naphthol, and eugenol were probably superior to benzidine and *p*-phenylphenol. The powders containing hydroquinone were most toxic to lice but caused a definite skin reaction. Pyrophyllite dusts appeared to be more effective than those made up with talc or kaolin as diluents.

Rotenone analysis: The rotenone content of samples of *derris*, *Lonchocarpus*, and *Tephrosia* from Central and South America, the Belgian Congo, and Tahiti, R. H. CARTER, S. B. SOLOWAY, H. D. MANN, and N. GREEN. (U. S. D. A.). (*Soap and Sanit. Chem.*, 21 (1945), No. 11, p. 127).

DDT as an insecticide—results of preliminary trials (*Agr. Gaz. N. S. Wales*, 56 (1945), No. 10, pp. 455–456, 467).

Solvents for DDT, H. A. JONES, H. J. FLUNO, and G. T. MCCOLLOUGH. (U. S. D. A.). (*Soap and Sanit. Chem.*, 21 (1945), No. 11, pp. 110–113, 115, 155, illus. 1).—This study—begun late in 1942—has been concerned with solvents suitable for use in preparations for control of insects affecting man; many of the large number of materials tested, discussed, and tabulated may prove useful in various other phases of the application of DDT. It is believed that, in general, biological tests should be made of any DDT solution or emulsion before it is recommended for use.

DDT toxicity, H. S. TELFORD (*Soap and Sanit. Chem.*, 21 (1945), No. 12, pp. 161, 163, 167, 169).—In the experiments reported, sufficient amounts of DDT were eliminated from the milk of two goats which had received single oral doses of 1.25 and 0.68 gm. per pound of body weight, respectively, to produce toxic symptoms and death in white rats 29 and 31 hr. after administration; the milk remained toxic for about a week. Of the 20 rats used, 11 died exhibiting typical symptoms of DDT intoxication. Cream from a goat which had received a single oral dose of 0.68 gm. of DDT per pound of body weight was considerably more toxic to white rats than skim milk from the same source. Milk and butter from goats orally treated with DDT were significantly toxic to laboratory-reared houseflies.

The residual toxicity of DDT: Influence of moisture and temperature on the residual kill of DDT, H. L. SWEETMAN. (Mass. State Col.). (*Soap and Sanit. Chem.*, 21 (1945), No. 12, pp. 141–149, 171).—DDT was found to exhibit a high degree of residual toxicity over considerable periods of time. Temperatures of 32°–37° C. with high relative humidity definitely reduced the time of residual effectiveness. Dry conditions at these temperatures and moist conditions at lower temperatures had but little deleterious effect on the residual toxicity of dust applications over considerable periods of time. Insects contacting DDT-treated surfaces rapidly reduced the effectiveness of the treated areas, thus reducing the residual period. There are 26 references.

Effects of different food plants on egg production and adult survival of the grasshopper, *Melanoplus bivittatus* (Say), O. E. TAUBER, C. J. DRAKE, and G. C. DECKER. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 4, pp. 343–359).—Field-collected specimens of the two-striped grasshopper were used in this study during 1938–40. Five pairs of newly emerged adults were placed before mating in each cage and fed throughout life on one kind of food, plants being either potted or cut and kept fresh in water; parallel cages with a “mixed diet” served as controls. Thirty different fresh plant materials, three drying foods, and one completely dry food plus water were used. Nearly 1,600 pairs of hoppers were tested

on the separate items; 250 pairs, on the control diet. Wild lettuce and alfalfa gave the highest egg production, averaging 141 and 140 eggs per ♀; other high egg producers were red clover, garden leaf lettuce, onion plants, soybean, and sweetclover. Castor-oil plants and ripe tomato gave the lowest egg yields, averaging 18 and 19 per ♀. On the other hand, the average number of eggs for the mixed diet was 91.1 per ♀. The high reproductive potentials with some of the plants lent support to suggestions by others that certain farm crops might sometimes offer exceptional nutritional advantages for building up higher populations than would occur in similar localities with only the natural wild plants available. No regular agreement appeared between egg production and those food preferences listed in other publications (21 references). The most striking food preference noted in the present work was for red clover blossoms; this feeding habit might become very disastrous for seed production, even when only moderate populations of hoppers were present. With the 12 foods tested in all three seasons there was a general agreement in results from year to year.

Although higher egg production is usually associated with longer adult survival, some noteworthy exceptions were revealed. Those ♀♀ feeding on corn silk or cottonwood leaves alone averaged 27.1 days survival from initial oviposition until death, this being the highest among 30 groups tested on fresh foods; the shortest survival was 9.6 days on mulberry leaves, but the average egg production here ranked twenty-fifth. There was a general positive correlation between high averages in egg production, number of pods, and eggs per pod. The necessity of abundant succulent foods was early demonstrated. Though fresh alfalfa gave an average of 140 eggs per ♀, drying alfalfa produced only 29; drying alfalfa and drying timothy were unable to support life very long. Individuals on dry foods became very nervous and more susceptible to slight stimuli which provoked unusually strong escape reactions; it is thought possible that such hyperirritability may be a factor in mass flights. In cages with dry food and no water, 59.3 of the dead showed some degree of cannibalistic attack, even when dead specimens were removed every morning and noon; none occurred when dried alfalfa plus water were supplied.

Catalogue of Apioceridae of the world, W. F. RAPP, JR., and W. E. SNOW (*Pan-Pacific Ent.*, 21 (1945), No. 4, pp. 157-160).—A listing, with literature references and localities, of the known species of these large flies, which are restricted to arid or semiarid regions.

Notes and descriptions of American Polyctenidae (Hemiptera), G. F. FERRIS and R. L. USINGER. (Univ. Calif. et al.). (*Pan-Pacific Ent.*, 21 (1945), No. 4, pp. 121-124).—On four species of *Hesperoctenes*, of which two are described as new.

A simple method of mounting aphids on microscope slides, J. B. MALTAIS (*Canad. Ent.*, 77 (1945), No. 6, pp. 103-104).—The method described involves preservation, dehydration, clearing, premounting, and mounting; it was devised especially for whole mounts of winged and wingless aphids on microscope slides but may be used successfully for other small insects and morphological parts of various kinds.

A new genus—Retusanus—and five new species of Mexican leafhoppers (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.). (*Pan-Pacific Ent.*, 21 (1945), No. 4, pp. 135-140, illus. 5).

A new Coenonycha from California (Coleoptera: Scarabaeidae), R. W. L. PORTS. (Univ. Calif.). (*Pan-Pacific Ent.*, 21 (1945), No. 4, pp. 141-143).—The new beetle described from grass land is *C. pascuensis*.

The effect of population density on longevity in *Trogoderma versicolor* Greutz. (= *T. inclusa* Lec.), M. B. DAVIS (*Ecology*, 26 (1945), No. 4, pp. 353-362, illus. 5).—Five groups of syracuse dishes were set up for studies of this beetle—a species not requiring food in the adult stage: A contained 1 ♀ or 1 ♂; B, 10 ♀♀ or 10 ♂♂; C, 30 ♀♀ or 30 ♂♂; D and E, ♀♀ and ♂♂ in a 1 : 1 ratio, D contain-

ing 5 ♀♀ and 5 ♂♂ and E 15 of each sex. These beetles were kept in otherwise constant conditions and observed twice daily. The ♀♀ had a greater life span in A and B and the ♂♂ in C, D, and E. The longevity of the ♀♀ decreased consistently with higher densities; the ♂♂ responded little or not at all to a density greater than 10 per dish. The ♀♀ lived longer at a given density with ♂♂ absent; the life span of the ♂♂ appeared to be increased by the presence of the ♀♀. The life tables based on B indicated that the greater longevity of the ♀♀ was due to a more gradual decline of the ♀ populations until after the ♂ populations had become extinct; in C there was little difference between the sexes. Experimental analysis of these results opens up considerable possibilities for future research: Among the factors which might be investigated are cannibalism, conditioning of environment, humidity or other physical changes in environment, and the possibility of arriving at an optimum number of ♂♂ per ♀. A final problem suggested is the alternate cyclical abundance of ♂♂ and ♀♀; it is believed that this may also be a function of density. There are 33 references.

The larvae of the Harpalinae Unisetosae (Coleoptera: Carabidae), H.-F. CHU. (Univ. Ill.). (*Ent. Amer.*, 25 (1945), No. 1, pp. 70+, illus. 92).—This contribution presents the findings of an investigation of the larvae of this group of ground beetles as concerns their biology and habits, external morphology, diagnostic characters, and classification (with keys to the genera and species). A review of the literature (4½ pages of references) and a description of the methods of study are also included.

Food-plants and distribution of the species of Calligrapha in Canada, with descriptions of new species (Coleoptera: Chrysomelidae), W. J. BROWN (*Canad. Ent.*, 77 (1945), No. 7, pp. 117–133, illus. 40).—The author lists—with notes on food plants, distribution, and variability—29 species of this beetle genus, including 8 described as new.

Changes in wireworm population associated with cropping, H. W. and M. MILES (*Ann. Appl. Biol.*, 32 (1945), No. 3, pp. 235–236).—Data are presented showing that the rate of decline in wireworm populations associated with a root crop is not significantly greater than in those associated with a cereal crop. The results on wireworm populations of adjoining pasture plots over 3 to 5 successive years indicated a slow rate of increase during the early years.

Synopsis of the Mexican species of Cardiochiles Nees (Hymenoptera: Braconidae), Y.-T. MAO. (Univ. Calif.). (*Pan-Pacific Ent.*, 21 (1945), No. 4, pp. 125–134, illus. 1).—This synopsis considers eight species—with key—of which two are described as new; the other six are new combinations.

On the occurrence of impaternal females in the Formicidae, C. P. HASKINS and E. V. ENZMANN (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 4, pp. 263–277).—The general question of the occurrence of parthenogenesis in the ants, and more especially the problem of the production of impaternal ♀♀, is here considered. The requirements to be met in studies designed to test the existence of thelytocous parthenogenesis in the group are outlined, and a program of this kind—at present in its early stages—is described. The preliminary data presented suggest the production of bona fide impaternal workers in two species of *Aphaenogaster*. The bearing of these results on certain general questions of the biology of ants is indicated. There are 32 references.

A new tribe and genus of nematine sawfly (Hymenoptera: Tenthredinidae), H. H. ROSS. (Ill. Nat. Hist. Survey). (*Pan-Pacific Ent.*, 21 (1945), No. 4, pp. 153–156, illus. 12).—Pristolini new tribe and *Pristola macnabi* n. gen. and sp. are described and illustrated.

An interesting new brachypterous species of Photopsis (Hymenoptera: Mutilidae), R. M. SCHUSTER. (Cornell Univ.). (*Pan-Pacific Ent.*, 21 (1945), No. 4, pp. 149–151).—*P. brachyptera* n. sp. is said to be the first known brachypterous

Hatching of the egg of *Ixodes ricinus* L., D. R. ARTHUR (*Nature* [London], 156 (1945), No. 3966, p. 538).—A preliminary note on the mechanism of hatching in the castor-bean tick, apparently not previously described.

***Ixodes tovari*, a new species from Mexico (Ixodidae)**, R. A. COOLEY (*Pan-Pacific Ent.*, 21 (1945), No. 4, pp. 144-148, illus. 2).—The ♀, ♂, and nymph of this new tick are described.

Principal properties of injurious insects surviving to field crop rotation, M. S. GHILAROV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 47 (1945), No. 3, pp. 211-214).—A brief analysis—with examples—of the ecological and biological relations of insect pests of crop plants, showing the role which crop rotation may be made to play in controlling or alleviating the damage they cause.

The use of DDT and 666 as insecticides against grain pests, I, II, (*Jour. Sci. and Indus. Res.*, 4 (1945), No. 2, pp. 73-79, illus. 2).—The following are included:

I. **Incorporation of DDT and 666 in wall washes** (pp. 73-77).—DDT (85 percent 4,4' isomer) emulsion incorporated in chalk wash and applied to concrete surfaces, killed the red flour beetle, lesser grain borer, and *Calandra* sp. in eight days exposure at concentrations as low as 17.7 mgm. per square foot and 0.19 percent of the chalk; 666 was as effective as DDT against the borer and *Calandra* sp., but appeared to be slightly less so against the red flour beetle. Lime had an adverse effect on the insecticidal activity of 666 and to a lesser extent on that of DDT.

II. **Effect of lime on DDT when incorporated in lime wash** (pp. 78-79).—When DDT was mixed with lime at 1 to 50 it was shown that solid DDT ground up with lime does not deteriorate appreciably within 24 hr. either in the wet state or when dried on glazed tiles; dispersed in lime wash as an alcoholic solution, DDT decomposed rapidly, but when dispersed in lime as an oil-in-water emulsion it was stable in the wet state though decomposing on being dried. The product of the reaction of DDT with lime was found to be mainly bis (4 chlorophenyl) dichloroethylene. The rate of degradation of DDT in lime washes depended on the state of division and intimacy of contact of DDT and lime in the aqueous mix and in the dried wash.

Effect of DDT, sulphur, and Lethane dusts on germination of sugar-beet and onion pollens, E. ARTSCHWAGER. (U. S. D. A.). (*Science*, 102 (1945), No. 2654, p. 482).—In the tests reported the indications were that germination of pollens of sugar beet and onion were not adversely affected by field applications of DDT dust, nor did Lethane B 71 at 30 to 40 lb. per acre appear to affect the germination of onion pollen.

New insecticides for control of alfalfa-seed insects, F. V. LIEBERMAN. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 3, pp. 3-4, illus. 1).—The use of DDT for protection against alfalfa insects proved effective, but it is pointed out that how this insecticide affects beneficial insects and livestock should receive consideration.

New insecticides give promise for control of *Lygus* bugs in alfalfa grown for seed, C. J. SORENSON and J. W. CARLSON. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 3, pp. 5, 11, illus. 1).—DDT at the rate of 10 percent gave the best control of *Lygus* and highest average yields of seed, while DDT 3 percent and sabadilla 10 percent ranked second and third, respectively.

Susceptibility of certain strains of field corn in hybrid combinations to damage by corn earworms, F. F. DICKE and M. T. JENKINS (*U. S. Dept. Agr., Tech. Bul.* 898 (1945), pp. 36, illus. 1).—Damage by earworms near Washington, D. C., during the period 1935-1942 was recorded in 20 experiments with field corn, which included top crosses, single crosses, and double crosses. By tests of top or single crosses it was possible to identify a group of inbred strains that were consistent in transmitting ear qualities to hybrids that gave good protection from earworm damage. The following inbred strains possessed this ability to an outstanding degree: Yellow strains CI.2, 23R7, CI.6, CI.7, Kys, J8-6G, J7-2E, 5675, CI.33, and

L317Lh; white strains K55, T18C, T85A, Ky27, Ky30A, CI.43, CI.61, CI.23, LanLhw, and 38Lhw.

Crosses of these strains in general had ears that were protected with husks that fit closely around and over the tip of the ear and extend at least 1 in. or more beyond the tip. The grain was above average in hard starch, either over the entire ear or at the tip. A long husk extension in itself did not offer the maximum protection against damage by earworms, but as a rule the long-husked strains sustained the least damage.

Factors for protection against damage by earworms expressed by inbred lines in single crosses also were present in their double crosses. For effective protection against damage in double crosses at high population levels it was found desirable to have three resistant inbred lines represented in the cross.

Available data indicate that important inbred lines now in commercial use may be greatly improved in earworm resistance through the use of proper breeding technics.

Insect parasites may reduce corn borer damage, L. A. CARRUTH. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, pp. 5-6).—A practical account.

***Lygus simonyi* Reut., as a cotton pest in Uganda**, T. H. C. TAYLOR (*But. Ent. Res.*, 38 (1945), No. 2, pp. 121-148).—The author reviews studies by himself and others (8 references) on this plant bug in Uganda, including information on the food and breeding host plants, its injuries to cotton, damage by other capsids (Miridae), natural enemies, course of the annual infestation at Kawanda in the elephant grass zone and at Serere in the short grass zone, and possible means of reducing the damage.

The use of tuber specific gravity in determining the effectiveness of leafhopper insecticides, J. W. APPLE and C. Y. ARNOLD. (Univ. Ill. et al.). (*Amer. Potato Jour.*, 22 (1945), No. 11, pp. 339-343).—The specific gravity of the tubers was taken on samples from a leafhopper insecticide experiment. Treatments resulting in tubers of the highest specific gravity and thus of the highest eating quality and starch content were those having the lowest nymph populations and best yields. The pounds of starch produced per acre—obtained by multiplying the percentage in the tubers by the yields—was shown to be a better criterion of the effectiveness of the insecticides than the yields obtained under the experimental conditions. The ease of making specific gravity determinations and the value of the supplementary data obtained render this criterion worth considering in tests of materials used against leafhoppers on potatoes.

Some factors affecting the insecticidal action of pyrethrum extracts on the beet leafhopper, F. H. HARRIES, J. D. DECOURSEY, and R. N. HOFMASTER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 12, pp. 553-565, illus. 1).—The influence of temperature and humidity on the insecticidal action of pyrethrum extracts against the beet leafhopper was studied under controlled conditions.

Leafhoppers were confined in screen-capped cages enclosed in a tubular air duct through which uniform charges of sprays or dusts were passed. Temperature influences were studied when the leafhoppers were sprayed with pyrethrum extract in oil at different temperatures and held for 24 hr. at the same temperatures, sprayed at a given temperature and held at different temperatures, sprayed at different temperatures and held at 80° F., and sprayed in one set of cages and transferred to clean cages. Results showed that mortality of leafhoppers sprayed with pyrethrum in oil could be increased by raising the temperature at the time of application but increased to an even greater extent by lowering it after application.

Practically, the best results in the field might be obtained by treating areas in the afternoon which would naturally be followed by lower temperatures at night. Higher mortalities were produced at lower humidities but the influence of humidity was less pronounced than that of temperature. Higher efficiency was obtained with lighter oils. A pyrethrum-water spray showed higher efficiency at lower holding temperatures with no significant influence from humidity. When pyrethrum was applied as a dust results proved similar to those of sprays in that pyrethrum was most effective at lower temperatures. No significant changes in the efficiency of the dust resulted from variations in humidity.

The sweetpotato leaf beetle *Typophorus viridicyaneus* (Crotch) in Kansas, H. B. HUNGERFORD (*Jour. Kans. Ent. Soc.*, 18 (1945), No. 4, pp. 154-155).—A brief report of damage by larvae of this beetle.

The hessian fly resistance of Pawnee wheat, R. H. PAINTER and E. T. JONES. (Kans. Expt. Sta. coop. U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 18 (1945), No. 4, pp. 130-149, illus. 5).—That the value of this new wheat is a result of both tolerance and resistance to the hessian fly in central Kansas is shown by (1) a 50-percent lower infestation than the susceptible Tenmarq wheat as measured by percentage of plants infested, (2) an approximately 75 percent lower tiller infestation than Tenmarq, (3) a decrease in size and developmental rate of the puparia and perhaps other biological differences, (4) comparatively low fly injuries to infested plants—especially in fall—and to individually infested tillers in both fall and spring, and (5) an excess in yield over Tenmarq up to more than twice as much as the latter under heavy infestation. All these factors must be considered in evaluating the hessian fly resistance of Pawnee. Evidence is presented that resistance—as measured by percentage of infested plants—may be decreasing because of the westward migration and survival of fly strains able to infest such varieties as Pawnee and Kawvale. The tolerance factors do not appear, however, to be greatly affected by any differences in the resistance of Pawnee to strains of the fly prevalent in different areas. If any sowing of Pawnee reduces the fly damage in central Kansas for only a few years, it will still prove of great economic value and, even if this resistance may be lost, it will continue to have the other desirable characteristics to recommend it. The variety should be used primarily as a supplementary means of fly control; if so employed it will result in increased yields in the presence of this pest. Use of other controls will possibly delay the spread or development of the type of fly able to survive on Pawnee; owing to its tolerance and resistance, use of this wheat does reduce the possibility of total crop failure from fly infestation.

Status of Ohio wheat pests in 1945, J. S. HOUSER (*Ohio Sta. Bimo. Bul.* 236 (1945), pp. 164-166, illus. 1).—This is the usual brief account of hessian fly with infestation percentage shown by counties and years. Mention is also made of black wheat stem sawfly, wheat jointworm, wheat sheath worm, chinch bugs, and spittle bugs.

Proceedings of the Association of Applied Biologists (*Ann. Appl. Biol.*, 32 (1945), No. 3, pp. 262-276, illus. 8).—The following papers are of interest to economic entomology: The Biology and Control of the Carrot Fly, by F. R. Petherbridge, D. W. Wright, and D. G. Ashby (pp. 262-264); The Carrot Fly in the Midlands, by A. Roebuck (pp. 264-265); and Investigations on the Control of Carrot Fly (*Psila rosae* F.) in Gardens, by G. Fox Wilson (pp. 265-276).

Fruit-piercing Lepidoptera in Nigeria, F. D. GOLDING (*Bul. Ent. Res.*, 36 (1945), No. 2, pp. 181-184).—Notes on some 24 species.

Amphorophora studies, G. F. KNOWLTON and M. W. ALLEN (*Canad. Ent.*, 77 (1945), No. 6, pp. 111-114, illus. 1).—To clarify the characters and relationships of some of the more recently described aphids of this genus, and particularly those infesting berry crops, a key for their identification is provided. Included are the

species known to occur in Utah and a few berry-infesting species not yet found in the State. Brief descriptions of those infesting *Ribes* are given, including an apparently undescribed species from *R. petiolaris*, as well as one from *Rubus parviflora*.

A change of name in Cerambycidae. W. S. FISHER. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 8, p. 251).—The preoccupied genus name *Cyllene* Newman, which includes the locust borer and the painted hickory borer, becomes *Megacyllene* Casey.

The deterioration of fire-killed white spruce by wood-boring insects in northern Saskatchewan. H. A. RICHMOND and R. R. LEJEUNE (*Forestry Chron.*, 21 (1945), No. 3, pp. 168-192, illus. 13).—This investigation, started in 1941 with early observations of the prevalence of wood borers in fire-burned areas of white spruce on the Carrot River watershed, Saskatchewan, was followed by intensive studies during the summers of 1942-44. The findings should be of special value to those concerned with the salvage utilization of fire-killed and damaged spruce. This report is concerned largely with an analysis of the injury caused by the round-headed borers—chiefly the white-spotted sawyer. Recommendations based on the behavior of wood-boring insects in white spruce as encountered in northern Saskatchewan are presented.

A new species of Agrilus from Kentucky (Buprestidae: Coleoptera). J. N. KNULL. (Ohio State Univ.). (*Ohio Jour. Sci.*, 45 (1945), No. 2, pp. 80-82, illus. 4).—The wood-boring beetle described and illustrated is *A. cladrastis* n. sp., collected on *Cladrastis lutea*.

Beetles attacking seasoned timber in South Africa.—I, The common furniture beetle Anobium punctatum De Geer, F. G. C. TOOKE (*Union So. Africa [Dept. Agr. and Forestry] Bul.* 246 (1944), pp. 15+, illus. 5).—Detailed information is presented on this wood-boring beetle and its control.

A pest of Yucca. E. E. HAVLAND (*Maryland Sta. Bul.* A37 (1945), pp. 103-112+, illus. 4).—This mirid, which attacks *Yucca*, has 5 instars, and the total nymphal period lasts from 23 to 29 days under laboratory conditions ranging from 51° to 80° F. During 1943-44 three generations occurred in Maryland. Eggs laid in October and November overwintered and hatched in late April or early May. Second generation eggs were observed the second week of June and those of the third generation in early August. Adults of the first generation were found in late May, the second about the middle of July, and adults of the third appeared the first week of September. The adults are active from four to eight weeks, depending on the generation involved. The eggs and nymphs are described and the habits are discussed. DDT proved useful for control.

Stored products and the insects infesting them as examples of the logarithmic series. J. L. HARRISON (*Ann. Eugenics*, 12 (1945), No. 4, pp. 280-282).—These examples of the logarithmic series were taken from the results of a tour of food supply depots in Africa and the Middle East undertaken with a view to control and prevent pest infestation. It is concluded that the species of insects found infesting foodstuffs are very much the same in different parts of the world, whereas the foodstuffs vary in detail from place to place.

Methyl bromide fumigation of plant products in railroad freight cars with special reference to work supervised by the Dominion Department of Agriculture during 1944. H. A. U. MONRO and R. DELISLE (*Sci. Agr.*, 25 (1945), No. 12, pp. 794-816, illus. 12).—The authors describe a successful campaign to prevent spread of stored-product insects found in imported plant products, infestations being eliminated chiefly by methyl bromide fumigation in steel freight cars at the port of importation or at destination. They also give an account of freight car treatments of exported foodstuffs prior to loading on steamship. By selecting suitable

types of steel freight cars satisfactory control of several species of insects was obtained in shelled peanuts, wheat in bags, chick peas, and cottonseed meal; in most cases a complete kill of all insects was obtained. The methyl bromide apparently had no adverse effects on the treated products, and residues analyzed in fumigated peanuts were without toxicological significance. For steel cars of airtight construction, 1.5 lb. of methyl bromide per 1,000 cu. ft. is recommended for exposure periods of 16 to 24 hr. at 60° F. and above; a graduated increase in dosage for lower temperatures is provisionally suggested.

Roach rearing and testing, L. J. BOTTIMER. (U. S. D. A. et al.). (*Soap and Sanit. Chem.*, 21 (1945), No. 12, pp. 151-159, 167).—The two papers presented—Roach Rearing and Testing, by L. J. Bottimer (pp. 151-159), and Modifications of the Liquid Roach Method, by F. O. Hazard (pp. 159, 167)—are said to present the latest developments on roach rearing and testing in a cooperative project carried out in an effort to arrive at a practical and uniform method of testing roach sprays.

Investigations into the fly populations of percolating filters, T. G. TOMLINSON and G. O. STRIDE (*Sewage Works Jour.*, 17 (1945), No. 6, pp. 1301-1302).—A preprint of a paper based on observations of trappings of flies made from a number of sewage purification filters.

Notes on the biology and control of *Chrysops discalis* Williston (Diptera: Tabanidae), C. M. GJULLIN and D. C. MORE. (Oreg. Expt. Sta. coop. U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 8, pp. 236-244, illus. 3).—This deer fly is a serious pest of cattle, horses, and man in the Summer Lake Valley, Oreg.; several cases of tularemia are also said to follow the bite of this fly almost every year. The waters of Summer Lake and Rest Lake, where most of the flies breed, are highly alkaline—ranging from pH 8.8 to 9.6—and the mud is saturated with H₂S. In July the larvae were obtained in mud samples taken as far as 100 ft. from shore under water up to 2 ft. deep; many larvae and pupae were also present in the soil bordering the lakes, and many flies emerged. Large numbers of eggs were found on the stems of *Scirpus americanus* on August 25, but none were observed on other plants. All these eggs had hatched by October 18, and the larvae were found in mud samples from near the shore to 30 ft. out in the lake. Large larvae in July and small larvae in October were obtained a half mile from vegetation, and may have been carried by water or wave motion. The eggs hatch 5 to 6 days after they are laid and the larvae molt about an hour afterward; the pupal stage requires 5 to 9 days.

Cattle were sprayed with 2- and 4-percent emulsions made from a stock emulsion containing 25 percent DDT, 68 percent xylene, and 7 percent Triton X-100 (an alkyl polyether alcohol); a half gallon per animal did not noticeably reduce the number of flies attacking. In laboratory tests, flies confined in glass jars coated with a 2-percent DDT emulsion for 2 min. and then transferred to clean jars were killed in 8 hr.; those confined for 10 min. and then transferred were killed in 4 hr. The same type of emulsion was tested against first and second instars in water, 1 part DDT to 10 million parts water causing a 72-percent kill in 48 hr. and 1 part to 5 million giving a 98-percent kill in 48 hr.

The tsetse fly in the Sudan, J. F. E. BLOSS (*Sudan Notes and Rec.*, 26 (1945), No. 1, pp. 139-156, illus. 7).—These notes on the tsetse fly in the Sudan are presented with the object of placing on record the author's observations on the present status of the problem.

The effect of fly food on resistance to insecticides containing DDT or pyrethrum, E. R. MCGOWAN and W. A. GERSDORFF. (U. S. D. A.). (*Soap and Sanit. Chem.*, 21 (1945), No. 12, pp. 165, 169).—Adult houseflies fed six different foods added to water were sprayed with pyrethrum extract and DDT, using the turntable method. The average kill for these two toxicants ranged from 41 to 77

percent for these foods; the differences in kill caused by the two materials applied to flies receiving the same food ranged from 19 to 37 percent of the population treated. Fresh skim milk—with or without formaldehyde—and spray-dried milk solids produced the most resistant flies and also those with the smallest range among the toxicants; sugar produced the least resistant flies.

The toxicity of DDT to the housefly (*Musca domestica* L.), E. A. PARKIN and A. A. GREEN (*Bul. Ent. Res.*, 36 (1945), No. 2, pp. 149-162).—DDT proved very toxic to the housefly as a spray containing 0.1 percent wt./vol. or more in kerosene. At 1 percent it was effective for practical use, but at lower concentrations the knock-down speed was too low; this difficulty was overcome by adding pyrethrum, 0.03 percent wt./vol. total pyrethrins and 0.1 percent wt./vol. DDT in kerosene being recommended as suitable for practical use. This mixture can be stored in glass bottles in the dark for 17 mo. at 27.5° C. without marked deterioration; its toxicity may be increased by incorporating a suitable activator, such as sesame oil or isobutylundecylenamide. DDT acted more slowly when dissolved in methylated spirit than in kerosene. Attention is called to the residual film effect of DDT on walls. The symptoms of poisoning of flies by DDT are compared with those caused by pyrethrum.

[Papers on mosquitoes] (*Mosquito News*, 5 (1945), No. 3, pp. 77-104, illus. 12).—The following are included: Circulation of Tide Water Saves Salt Marsh and Stops Mosquito Breeding, by F. A. Reiley (pp. 77-78); An Insect Light Trap for Use With Auto Vehicles in the Field, by E. A. Seaman (pp. 79-81); Outdoor Rearing of *Anopheles quadrimaculatus* Say, by P. M. Eide (pp. 82-85) (U. S. D. A.); The Occurrence of *Psorophora mexicana* (Bellardi) in the United States, by C. R. Joyce (p. 86); Analysis of a Tidal Ditch and Its Crossings, by L. Dalencour (p. 87); A New State Record of *Megarhinus rutilus* Coquillett in South Carolina, by S. J. Carpenter and D. W. Jenkins (p. 88); Ecological Observations and Recent Records on Mosquitoes of San Diego and Imperial Counties, California, by E. A. Seaman (pp. 89-95); Collection Records of *Mansonia titillans* (Walker) and *Mansonia indubitans* Dyar and Shannon in Florida With Keys to the Species of *Mansonia* in the United States (Diptera: Culicidae), by R. W. Chamberlain and T. E. Duffey (pp. 96-97); and The Effect of Drying on the Viability of *Aedes* Mosquito Eggs, by W. W. Yates (pp. 98-99), and DDT Residues on Vegetation and Ground Litter for Control of Adult Salt-Marsh Mosquitoes, by A. H. Madden, A. W. Lindquist, and E. F. Knipling (pp. 100-104) (both U. S. D. A.).

Seasonal variations in certain species of mosquitoes (Diptera: Culicidae), C. D. MICHENER (*Jour. N. Y. Ent. Soc.*, 53 (1945), No. 4, pp. 293-300).—Seasonal variation was found to occur in larvae and adults of *Culex* (*Neoculex*) *apicalis* and in adults of *C. (Culex) nigripalpus* and *C. (Melanconion)* spp. in the southeastern United States. In all three species, the adults had more extensive white areas on the abdomen in winter than in summer, and in at least the first two the winter specimens averaged larger than the summer ones. Winter larvae of *C. apicalis* were not only larger but also darker and slightly different structurally from the summer specimens. Seasonal differences were not observed in four other species of *Culex*. In *C. apicalis* conspicuous seasonal variation in adults was apparently limited to the southeastern states other than Florida. In the North and West all specimens were similar to the winter form of the Southeast; in Florida the summer form of the other southeastern States appeared to occur throughout the year.

Studies on the anopheline complex of western America, T. H. G. AITKEN (*Calif. Univ. Pubs. Ent.*, 7 (1945), No. 11, pp. 273-364+, illus. 39).—Because of widespread interest in the races and subspecies of *Anopheles* and of the necessity for accurate knowledge of these disease-bearing insects, the author undertook an investigation of the possibility of such complexes existing in the fauna of western North

America; this monograph is the result. Keys to the ♀♀, ♂♂, larvae, pupae, and eggs are included.

Additional wild-caught *Anopheles punctimacula* D. and K. infected with malaria plasmodia in Colombia, South America, C. B. HUFFAKER, H. SOTO, and H. REY (*Amer. Jour. Hyg.*, 42 (1945), No. 2, pp. 107-110).—A brief review of the literature (12 references) together with findings from recent studies in Colombia. The conclusion is that this mosquito may be a dangerous malaria vector wherever it is produced in abundance.

Anopheline mosquitoes of the Solomon Islands and New Hebrides, J. N. BELKIN, K. L. KNIGHT, and L. E. ROZEBOOM (*Jour. Parasitol.*, 31 (1945), No. 4, pp. 241-265, illus. 27).—Keys to the adult ♀♀ and ♂♂, pupae, and fourth instar larvae are included, and one new species is described.

A new anopheline from the Solomon Islands with notes on its biology, W. B. OWEN (*Jour. Parasitol.*, 31 (1945), No. 4, pp. 236-240, illus. 2).—*Anopheles koliensis* n. sp. is described and illustrated.

Studies on the breeding places and control of *Anopheles gambiae* and *A. gambiae* var. *melas* in coastal districts of Sierra Leone, R. C. M. THOMSON (*Bul. Ent. Res.*, 36 (1945), No. 2, pp. 185-252, about 60 illus).—A comprehensive report on these mosquitoes and their control in the above area.

***Mansonia indubitans* Dyar and Shannon—a new mosquito addition to the United States fauna, H. D. PRATT** (*Jour. Kans. Ent. Soc.*, 18 (1945), No. 4, pp. 121-129, illus. 14).—Includes keys to females and larvae of three Caribbean species and to the pupae of two.

A comparison of mosquitoes captured with avian bait and with human bait, D. E. DAVIS (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 8, pp. 252-256).—Extensive captures of mosquitoes in Teresópolis County, Rio de Janeiro State, Brazil, made possible a comparison of preferences of related mosquitoes for avian v. human bait; species even within the same genus were found to differ in this respect.

Recording of sounds produced by certain disease-carrying mosquitoes and their possible significance in control, M. C. KAHN, W. CELESTIN, and W. OFFENHAUSER (*Jour. Bact.*, 50 (1945), No. 2, p. 239).—An abstract.

The spring phenology of plants in and around the reservoirs in north Alabama with particular reference to malaria control, W. T. PENFOUND, T. F. HALL, and A. D. HESS (*Ecology*, 26 (1945), No. 4, pp. 332-352, illus. 4).—The results of phenological observations in this section of the Tennessee Valley Authority, 1941-44, are presented. The seasonal march of periodic events in the life cycles of plants in these reservoirs was governed primarily by temperature and water levels. Leaf production near the water surface—the most important aspect of phenology in relation to breeding of the common malaria mosquito—was found to be delayed or prevented in many species by proper manipulation of water levels. In applying such a management schedule for malaria control, a minimum of recession proved desirable since it restricted the band of vegetation available for anopheline breeding. Certain herbs were found primarily in spring-fed areas where the winter temperatures were higher; these species included submerged, submerged forms of emergent, pleustonic, and attached floating plants. In the wetland and aquatic plants the principal overwintering structures were roots, rhizomes, stolons, and entire plants; more species apparently overwintered entire than in any other form. Some emergent herbs sprouted in water 1 ft. or more deep and later grew to or above the water surface. Full verdure was maintained by most submerged species throughout the winter, but was rarely attained by emergent, wetland, and terrestrial species until well after the spring equinox. In general, flowering was initiated about a month after full verdure. Dewatering was usually necessary for sprouting of underwater perennating parts, seed germination, or flowering and fruiting.

The growth of woody species was initiated in late February; species under natural conditions resumed activities 7 to 10 days later than in towns and cities. The greater number of deciduous woody species attained complete leafage during the last 2 weeks of April or the first 2 of May. Flowering of trees was limited largely to March-June. On the average, woody species came into flower about 2 weeks earlier than they reached full foliage; herbaceous species blossomed about 4 weeks after full verdure. Species which initiated flowering in February-March exhibited longer anther periods than those starting to bloom in April-June. Of the more important species in relation to malaria control, the black willow and green ash initiated flowering in mid-April; the buttonball and trumpet vine, in June. The following events usually took place about 2 weeks before initiation of the breeding season of the mosquito: Appearance of the first leaves of lotus (*Nelumbo pentapetala*), flowering of the cowlily (*Nuphar advena*), and flowering of the black willow (*Salix nigra*).

Experiments with DDT in solutions and emulsions against mosquito larvae in west Africa, P. A. BUXTON (*Bul. Ent. Res.*, 36 (1945), No. 2, pp. 165-175).—Small field experiments are described with DDT in emulsion and in solution in mineral oils—5 percent pure DDT in each material—tested against mosquito larvae (mainly *Anopheles funestus*) under conditions providing good opportunities for repetition and measurement of dosage per unit area. Preliminary work had shown that kerosene or diesel oil without DDT were not larvicidal up to 0.5 cc. per square yard. Under the rather precise test conditions it became clear that the diesel oil solution of DDT was more effective than the emulsion, both in minimum amount required to kill and lasting effect. Field tests seemed to indicate that DDT dissolves from oil into water so as to make a larvicidal solution, at least when the water is shallow. For some unknown reason, the effect passes off in a few days, even on stagnant waters. A heavy dosage of DDT gives a period of complete kill, followed by a period of partial irregular control; this irregular effect was observed more often with solutions than emulsions and might last as much as 4 weeks. Except in one test in which the emulsion destroyed small fish, there was no evidence that creatures preying on the larvae were destroyed.

The brown dog tick, with special reference to its control and eradication, S. S. MILLER (*North Amer. Vet.*, 26 (1945), No. 11, pp. 669-671).—This paper represents "a compilation of pertinent facts and ideas taken from articles, communications, and the author's own experiences. . . ."

Further toxicity studies with the dog tick *Dermacentor variabilis* (Say), A. H. TAUBER, C. R. JOYCE, and O. E. TAUBER. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 4, pp. 429-433).—Unfed adult American dog ticks dipped directly into suspension of less than 1 percent rotenone showed a high mortality. The lethal effects did not appear promptly; none of the ticks had died 2 hr. after exposure to 0.075 or 0.15 percent rotenone dips, but 3 days afterward 74 and 98 percent had died. Untreated controls exhibited only 4 percent mortality in the same period. The protection afforded by the fibers of a very thin layer of cotton appeared to lessen the effectiveness of rotenone against ticks, even with longer exposures than that from direct dipping. It is suggested that the hair of dogs might also offer protection to ticks during rotenone dip treatments unless the suspension were rubbed into the coat. Nicotine at equally low concentration in water appeared highly effective for killing ticks and to act more rapidly than rotenone; 79 percent of the ticks held for 2 min. in a 0.069 percent nicotine solution and 100 percent of those similarly treated with a 2 percent solution were dead within 2 hr. The ticks proved more susceptible to equivalent amounts of nicotine in dips than in impregnated sulfur dusts.

areas on a sheep and of suspending them for individual tests. It is shown that chemical potentials rather than concentrations should be used in comparing toxicities of different dips. Each toxic substance tried acted more rapidly at a given concentration in a medium in which it was less soluble. Acid solutions of arsenious acid acted more rapidly than alkaline ones. Solid arsenious oxide as crystals or deposits on wool acted more slowly than sodium arsenate under the same conditions—probably because of its slow rate of solution. Arsenious oxide and sodium arsenate readily penetrated the tips of the feet and the latter also the dorsal surface of the tick. Previous work had demonstrated that arsenic is a contact rather than a stomach poison to ticks. Phenols were toxic at low concentrations in water; their greater solubility in wool fat and rapid evaporation explain their ineffectiveness as dips. DDT penetrated the feet of the ticks more readily than the rest of their body surface; it acted more rapidly at 1 percent in paraffin (solubility 1–3 percent) than in sesame oil (solubility 10 percent). Saturated solutions had the same effect. Similarly, vaseline solutions were more effective than those in lanoline. Rotenone penetrated the feet more quickly than the back. Larvae were more rapidly intoxicated by 0.1 percent solutions in olive oil (solubility 0.2 percent) than 0.1 percent solutions in castor oil (solubility 1–2 percent); saturated solutions had the same effect. The importance of site of entry of insecticides is stressed. The less soluble the substance in the medium, the less is needed to give a high chemical potential and the more rapid will be the penetration; with low solubility, however, a small loss by diffusion causes a large fall in potential. In practice, media will be needed in which the toxic substance is neither so soluble as to be wasteful in giving a high potential nor so insoluble that losses by diffusion cause large falls in potential. The carrier activity of different oil bases for insecticides and synergistic action may in part be due to changes in solubility and hence in chemical potential. There are 33 references.

At what temperature will bees fly? C. R. WALKER (*Gleanings Bee Cult.*, 73 (1945), No. 11, pp. 452–453).—A brief note on experimental findings, with comment by E. R. Root.

Diseases of bees ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul.* 100 (1945), pp. 25+, illus. 8).—An informative contribution.

ANIMAL PRODUCTION

The composition and apparent digestibility of bluestem grass in the growing stage, and in the dry and hay stages when supplemented with cottonseed cake, C. S. HORBS, W. D. GALLUP, and B. R. TAYLOR (Okla. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 395–402).—The composition of native pasture grass, predominantly bluestem, was determined at frequent intervals during the grazing season and winter of 1942–43. The dry matter varied from 32.7 to 39 percent from late May to the middle of September. The composition of the dry matter varied from 6.77 to 8.97 percent in protein and from 28.46 to 32.32 percent in crude fiber. The protein decreased to 4.31 percent and the crude fiber increased to about 34 percent after September, and further decrease of the protein to 2.56 percent without a corresponding increase in crude fiber took place during the winter. Variations in nitrogen-free extract were small and irregular throughout the summer and winter. The apparent digestibility of dry matter, protein, and crude fiber of the grass was lower in June than in July, August, and September, and there was practically no change during the latter months in digestibility of nutrients with the exception of protein and ether extract, which showed some marked changes. The digestibility of the dry winter grass was higher in December than in January and February. The digestibility of both winter grass and prairie hay rations was improved by supplements of cottonseed cake. The fecal excretion of nitrogen and ether-soluble material was greater in steers on pasture than in steers in dry lot.

Pit silos for the storage of Atlas sorgo grain and of soft corn, H. E. BECHTEL, F. W. ATKESON, F. C. FENTON, and W. M. CARLETON. (Kans. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 438-452, illus. 2).—In studies at the Kansas Station and in eight similar pits at the Colby and Garden City Substations, newly threshed Atlas sorgo grain and chopped and unchopped heads of the same crop and soft corn were stored separately with and without water in pit silos 4 ft. in diameter and 5 ft. deep, dug in silty clay loam and silt loam soil at its maximum water-holding capacity. Each pit was lined with a single thickness of burlap. The feeds were stored from 8 to 9½ mo. Chemical analyses were made of the feeds before and after storage, and temperatures of the feeds and soil were recorded during the storage period. Some observations on the feeding value were made with dairy heifers. The principal conclusions were: "(1) Sorgo grain, sorgo heads, and soft corn can be stored with moderate losses as feed in pits in the ground for periods of at least 8 mo. after the end of the growing season. (2) Flooding sorgo grain is unnecessary and may be objectionable when using this type of storage. (3) Chopping and flooding with water promoted better packing and less heating of sorgo heads in small pits. (4) Chopping promoted better packing and less heating of soft snap corn in small pits. (5) The proportionately large losses encountered from spoilage in some of the small experimental pits used in these studies probably can be reduced to much lower percentages by using larger storage pits and by feeding during the same season."

Feeding cottonseed products to livestock, N. R. ELLIS and R. E. HODGSON. (U. S. D. A.). (*Flour & Feed*, 46 (1945), No. 5, pp. 7-8).—A general statement on the use of cottonseed products as a source of protein for livestock, including the analysis of several portions of the seed.

Comparison of different amounts of protein supplement for wintering beef cows on forest range in the southeastern Coastal Plain, J. E. FOSTER, H. H. BISWELL, and E. H. HOSTETLER. (N. C. Expt. Sta. coop. U. S. D. A. et al.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 387-394, illus. 2).—Studies were made of the effects of wintering cows on native forest range of the southeastern Coastal Plain when the cows were fed different levels of protein supplements, taking into consideration winter and summer gains of cows and calves, death losses, percentages of calf crops, and other items of practical importance. Snapp (E. S. R., 82, p. 373) has emphasized that the plane of nutrition under which cows are wintered greatly affects their future usefulness. Three feeding trials were conducted.

In the first trial 2 groups of 27 grade Hereford cows and 3-year-old heifers each were bred to calve between February 1 and May 1, with rotation between forest ranges, and weighed every 28 days. Comparison was made of daily supplements in different lots of 2 and 4 lb. per head of 36 percent crude protein cottonseed pellets or meal fed January 16 to May 8, 1942. Both groups calved normally and weaned an average of nearly 70 percent calf crop. However, cows in the 2-lb. group lost considerably more weight during the feeding period than those in the 4-lb. group, and they weaned slightly fewer calves of lighter weight at the end of the feeding period. Two cows in the 2-lb. group died because of poor condition and weakness. During the grazing period the cows in the 2-lb. group gained more rapidly, so that at the end of the grazing period the weights of the cows in the 2 groups were about equal.

In the second trial 3 groups of 32 Hereford cows and heifers were furnished 2, 4, and 6 lb. of soybean meal (36 percent) per head from December 18, 1942, to May 4, 1943. For the wintering period cows in the 4-lb. group lost less weight than those in the 2-lb. group, and those in the 6-lb. group practically maintained their weight. The dry cows made gains directly proportional to the amounts of protein concentrate eaten. The calf gains in the wintering period were nearly 50 percent

greater where the cows received 6 lb. of soybean meal per head daily than the gains of those in the 2- and 4-lb. groups. During the following summer the gains were again about reversed from the winter gains. Gains of the calves were about equal in the 3 groups, considering winter and summer gains together.

The third winter trial lasted from December 30, 1943 to April 24, 1944. There were 3 groups of 30 to 31 cows each, fed 31 percent protein cottonseed meal at rates of 2, 4, and 6 lb. per head daily. The cows were continued with the same amounts of supplements as in the previous year to study the cumulative effects of feeding protein concentrates at the different levels. The cows in all 3 groups calved without difficulty, but the percent calf crop was less than it had been in the two previous years. The reduction was considerably greater in the lots receiving 2 and 4 lb. than in those receiving 6 lb. and was due to differences in the amount of concentrates given the previous winter. The decrease was considerably greater in the groups receiving 2 and 4 lb. than in those receiving 6 lb. By more rapid summer gains all were in nearly equally as good condition at the close of the grazing season, but many were in apparently too poor condition at breeding time to conceive, so that the 6-lb. group weaned more calves. The most economical practice may consist of feeding 2 lb. during the first part of the feeding season and increasing it as the condition of the forage and the cattle warrant.

Winter rations for steer calves in preparation for summer pasture, G. A. BRANAMAN (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 1, pp. 49-51).—With the double objective of producing two groups of yearlings suitable for pasture in the spring, one in rather thin flesh and the other with more weight, flesh, and fatness, and comparing corn silage and hay as basic feeds for producing the two kinds of cattle, four lots of 12 choice quality Michigan- and Texas-bred calves of 437 lb. average weight were fed from December 27, 1944, to May 28, 1945. Lot 1, fed alfalfa-clover hay with light brome grass and timothy mixture and enough corn to gain about 1 lb. per day, made an average daily gain per head of 0.95 lb. at a cost of 18 ct. per pound of gain. Lot 2, receiving the hay with sufficient corn to produce corresponding gains of about 1.5 lb., gained 1.51 lb. at a cost of 16 ct. Lot 3, receiving a full feed of corn silage plus hay ad libitum, soybean oil meal, and enough corn to produce gains at least equal to those in lot 2, gained 1.64 lb. per head at a cost of 11 ct. per pound. Lot 4 received a full feed of the hay and enough corn silage to produce gains similar to lot 1, the gains and costs being 0.86 lb. and 15 ct. The high value of corn silage in steer wintering rations was indicated.

The nutritive value of corn cobs in beef cattle rations, W. BURROUGHS, P. GERRAUGH, A. F. SCHALK, E. A. SILVER, and L. E. KUNKLE (Ohio Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 373-386).—A basal ration without corncobs was compared in digestibility with a similar ration to which varying amounts of corncobs were added, in digestibility studies with Hereford steer calves and yearlings at different periods of growth, using 15-day collection periods for large and small groups but mostly of 20 each. Gaseous losses were estimated by the method of Kriss (*E. S. R.*, 62, p. 862). The nutritive value of the corncobs in 13 digestion comparisons with 4 steers each averaged 51.6 lb. of total digestible nutrients in 100 lb. of corncobs. Average figures indicated that cobs for cattle were 64 percent as valuable as grain itself for energy or fattening purposes. In eight feed lot comparisons, using a total of 192 cattle, the corncob replacement value of the corn grain averaged 62 percent. This value is considered to be tentative and not necessarily final. It appeared that there were fluctuations in cob utilization, the partial cause of which is believed related to microbiological digestion, in which the influencing factors are little understood at present.

Feeding blackstrap molasses to fattening steers, C. I. BRAY, M. G. SNELL, F. L. MORRISON, and M. E. JACKSON. (Coop. U. S. D. A. et al.). (*Louisiana Sta.*

Bul. 394 (1945), pp. 43, illus. 1).—Carrying forward studies on rice byproducts for fattening steers (E. S. R., 93, p. 182), several experiments were conducted from 1929 to 1942 to study gains and carcass grades of steers fed rations of ear corn, cottonseed meal, hay with and without silage, molasses, and various rice byproducts. The roughage consisted mostly of rice straw.

In three experiments averaging 112 days with 2, 4, 6, and 8 lb. of blackstrap molasses per day as an average of the 3 yr., 1939–41, the ration of rice bran, rice polish, molasses, cottonseed meal, and rice straw with a small amount of alfalfa hay to supply vitamin A produced an average gain of 2.37 lb. per head per day, second only to the lot on corn alone. No great difference resulted from feeding the 12.5, 25, 37.5, and 50 percent blackstrap molasses in the concentrate ration together with rice bran, rice polish, and cottonseed meal. The steers fed 4 lb. of molasses made slightly higher gains than the lots receiving 8 lb. of molasses and made the third highest profit. The lowest gains and least profit were made by the steers fed rice products without either corn or molasses as carbonaceous concentrates. The rice byproducts showed a value of 74 to 75 percent that of corn, but the percentage value was probably too low because the whole ration was not well balanced. With the exception of the lot which received 4 lb. of molasses per day, the replacement value of molasses was remarkably uniform, there being practically no difference in the replacement value per pound when feeding either 2, 6, or 8 lb. of molasses per day.

As a final test six lots of steers were selected in 1941–42 for comparing various rice products with and without rice bran, rice polish, rice straw, molasses, and legume hay for making gains and having different slaughter value per hundredweight. The substitution of 33 percent molasses for an equal amount of corn in a ration of corn, cottonseed meal, rice bran, and rice straw increased the gains and raised the selling price as compared with cattle receiving no molasses. A ration of corn, cottonseed meal, rice bran, molasses, and rice straw made slightly higher gains than the ration of corn, cottonseed meal, and rice straw, but the sale price was lower for the steers. Molasses seemed to be more satisfactory when combined with certain feeds than with others. Steers fed molasses usually ate a little more roughage than when combined with similar rations without molasses.

In each of the tests there were usually about 10 steers per lot fed for about 4 mo. in dry lot. In one test molasses and a bagasse-molasses mixture were compared with no molasses in rice bran and rice straw rations for steers. In one experiment on pasture, a ration of corn and cottonseed meal was compared with corn, cottonseed meal, rice bran, and molasses. Earlier work at the station and elsewhere is reviewed, and a bibliography of 47 titles is appended.

Digestibility of green mungbean seed by lambs, H. M. BRIGGS and V. G. HELLER. (Okla. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 430–434).—Ground mung beans, which were found earlier by the station to supply one-half to two-thirds of the protein required by feeder lambs, were shown to be quite digestible in experiments with four yearling fine-wool wethers. The apparent digestion coefficient of protein, determined by difference, averaged 77.1 percent when the beans were added to low-grade prairie hay. With general improvements in the ration, the apparent digestion coefficients of fat, fiber, and nitrogen-free extract increased to over 100 percent. In a second experiment with eight fine-wool wether lambs, beans were added to a better grade of hay than that used in the first trial. The apparent average digestion coefficient of the protein in the beans was 84 percent, the nitrogen-free extract 90 percent, and fat and fiber again more than 100 percent. The biological value of the protein in rations of prairie hay and mung beans was similar to that found with prairie hay supplemented with more commonly used sources of vegetable protein.

Methionine increases the value of urea for lambs, J. K. LOOSLI and L. E. HARRIS. (Cornell Univ.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 435-437).—The protein synthesized from urea in the rumen of lambs was greatly enhanced by the addition of methionine. Five rations were fed to each of five lambs in a balance study in a 7-day preliminary and 10-day collection period, with weights of lambs reported at the beginning and end. It was evident that the addition of urea to the basal ration increased the daily rate of gain from 0.07 to 0.17 lb. When methionine was added the daily gain was increased to 0.28 lb.

Urinary 17-ketosteroid excretion by boars, W. W. GREEN and L. M. WINTERS. (Minn. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 71 (1945), No. 11, pp. 507-517, illus. 1).—Urinary 17-ketosteroid excretion by boars of different lines of inbred swine was assayed from 48-hr. urine samples. The residual red color of the benzene extracts was not found to affect materially the results of the assays. Correlations between the amount of urine per sample and 17-ketosteroids per sample were always positive and in some cases significant, but the quantity of urine apparently had no real effect on the 17-ketosteroid values. A sharp rise in 17-ketosteroid excretion was not found at the time of puberty. In one stag, sufficient androgens were excreted to be assayed by the capon comb technic 58 days after castration, but not 68 days after the operation. Significant effects of the season on hormone excretion were noted. Age and line of breeding were found to determine the amount of 17-ketosteroids in boars' urine. An association was found between the amount of hormone excreted and the sexual behavior of the boars. Some line differences in sex drive and somatic responses to the hormones were observed.

Effect of diet on gestation-lactation performance of sows, B. W. FAIRBANKS, J. L. KRIDER, and W. E. CARROLL. (Univ. Ill.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 410-419, illus. 1).—The gilts from the test with distillers' byproducts for growth in a previous study (E. S. R., 91, p. 455) showed a ration of yellow corn, soybean meal, tankage, fish meal, fortified cod-liver oil, and minerals to be nutritionally inadequate for gestation and lactation under dry-lot conditions. Lots of gilts had 6 and 12 percent of dried corn solubles, a combination of alfalfa meal and dried solubles, alfalfa meal alone, or 6 percent of a mixture of six crystalline B-vitamins. The value of alfalfa meal and solubles is attributed to the water-soluble B-vitamins present. Feeding during gestation is an important factor for lactation. The residual effect of feeding rations supplemented with B₂ complex during gestation was manifest during the following lactation period. Only 13 percent and 7 percent of the pigs were weaned on the basal ration, while 83 percent and 82 percent of the pigs were weaned by sows fed alfalfa meal during the gestation period and when the basal ration only was fed during lactation. The importance of adequate nutrition during gestation and the value of alfalfa meal as a B₂ complex supplement was demonstrated. Sows fed the combination of 6 percent solubles and 4 percent alfalfa meal during gestation weaned 85 percent of their pigs even though they were fed the basal ration during lactation. The six crystalline B-vitamins were effective in supplementing the basal ration, but the residual effect was not manifest quantitatively to the same degree as in groups fed natural vitamin carriers. There is a greater tissue storage of known factors or a storage of unknown factors by the groups fed alfalfa meal or the soluble-alfalfa meal combination. Differences in the lactation performance of sows due to ration differences should be considered.

Distillers' by-products in swine rations.—III, Dried corn distillers' solubles, alfalfa meal, and crystalline B-vitamins compared for growing-fattening pigs in drylot, B. W. FAIRBANKS, J. L. KRIDER, and W. E. CARROLL. (Univ. Ill.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 420-429, illus. 2).—Continuing these studies (E. S. R., 91, p. 454), weanling pigs that had been confined in dry lot from birth

were fed a basal ration of ground yellow corn, wheat flour middlings, soybean meal, fish meal, tankage, minerals, and fortified cod-liver oil, or a basal ration supplemented with either (1) crystalline B-vitamins, (2) 6 percent dried corn distillers' solubles, or (3) 10 percent alfalfa meal. The chemical analyses and vitamin assays indicated that the basal ration contained adequate amounts of nutrients for the pig, but in some respects it proved to be very inadequate. The gains were increased 16 percent and death losses decreased when the basal ration was supplemented with 6 percent dried corn distillers' solubles. Growth response increased and death losses decreased from 31 to 9 percent when the basal ration was supplemented with six crystalline B-vitamins. This supplement was not as complete nutritionally as 10 percent alfalfa meal, but it was superior to corn distillers' solubles. The additional response of the pig to crystalline B-vitamins suggests that either (1) the vitamin assay values may be too high; (2) the published vitamin requirements for the pig may be too low; (3) the vitamins in natural ingredients may not be as available to the pig as to the micro-organisms used in microbiological assays; or (4) there may be a combination of two or more of these factors. Alfalfa meal, which was a more adequate supplement in promoting normal development of feet, legs, gaits, and thrift than other supplements, may have supplied factors in addition to the B-vitamins required by the pig. A residual effect of the higher nutrition level was noted during the post-weaning period in pigs that had nursed sows receiving a fortified ration during lactation. Fortification of the lactation ration reduced death losses of the pigs during the growing-fattening period. Pigs that "goose-stepped" showed moderate proliferation of the Schwann cells and marked demyelination of the fibers of the sciatic nerve. The nerve changes in mildly affected pigs were similar but less marked, and there were no changes in the nerves from normal pigs. The study was conducted with 1 lot of 13 pigs fed the basal ration and 3 lots of 11 pigs each receiving the three supplements from weaning to about 200 lb. in weight.

A comparison of different phosphate supplements for hogs and rats, C. L. SHREWSBURY and C. M. VESTAL. (Ind. Expt. Sta.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 403-409).—The results of three experiments in which various P supplements were fed for comparison to growing pigs showed that the defluorinated phosphate and rock phosphate were not equal to steamed bone meal and superphosphate in producing high-quality bone. The percentage of F in the bone, which ranged from 0.04 to 0.61, increased somewhat in proportion to the percentage of F in the ration. A saturation or threshold level of F was reached in the ration beyond which storage is reduced. F storage in the bone was not related significantly to either the percentage of ash, length, diameter, wall thickness, or weight of the bone. However, those pigs receiving defluorinated phosphate produced bones of the lowest ash, the lowest weight, and the least wall thickness. The breaking strength was not proportional to the F content, and the results were usually not related to the F content of the ration. For bred sows and gilts steamed bone meal was only slightly superior to defluorinated phosphate and rock phosphate. In experiments with rats, the F content of the ration and the form of P in the mineral influenced the retention of Ca and P. Growth was affected more by the form of P than by the F content of the ration. The minerals studied had similar effects on reproduction.

Growth and development, with special reference to domestic animals.—LX, Field studies on cardio-respiratory functions and energy expenditure during work and recovery in mules, H. H. KIBLER and S. BRODY (*Missouri Sta. Res. Bul.* 394 (1945), pp. 34, illus. 11).—In continuation of this series (*E. S. R.*, 91, p. 453), the apparatus and methods are described for field measurement of energy expenditure and cardiorespiratory activities in four mules during rest and at work at moderate and overload rates and during recovery from work. The relations between work rate on the one hand and energy expenditure on the other as obtained

under average field conditions are presented in tables and charts. Significant differences were demonstrated, in their responses to overload work in different mules, for pulse rate, respiration rate, pulmonary ventilation rate, work efficiency, oxygen debt, rectal temperature, oxygen decrement, and carbon dioxide increment. The relation between oxygen debt and such cardiorespiratory activities as pulse rate and respiration rate during overload work was given special attention.

A good correlation is reported between the degree of physical exhaustion as measured by the attained oxygen debt and cardiorespiratory distress as indicated by the increases in the cardiorespiratory functions. As the index of oxygen debt is measured with relative ease, it is suggested that this may turn out to be a good index of endurance.

The deleterious effect in dogs of a dry protein ration, T. S. DANOWSKI, J. R. ELKINTON, and A. W. WINKLER (*Jour. Clin. Invest.*, 23 (1944), No. 5, pp. 816-823, illus. 3).—Dogs were maintained in nitrogen equilibrium on small amounts of dry protein (1.5 gm. per kilogram) without water, and no changes in nitrogen excretion occurred, but larger amounts of protein (2 to 7.2 gm. per kilogram) increased the metabolism and the nitrogenous end products in the urine. A larger urine volume is necessitated by the increased excretion of nitrogen, even when dehydration is present. The dehydration is increased and the time shortened for survival by greater amounts of dry protein than that necessary for nitrogen equilibrium without adequate supplies of water. Dogs were maintained in excellent condition for at least 4 weeks on similar amounts of protein with an adequate intake of water (whole fish). In the dog, carbohydrate can conserve water. Economy of body water results from a decrease in protein metabolism and in the amounts of nitrogen necessitating excretion. The water of oxidation of the carbohydrate is also made available. The studies were conducted with 14 adult dogs for different periods of time up to 16 days with dry protein, carbohydrate, or raw fish rations, or the dogs were fasted. The weights and nonprotein nitrogen concentrations of dogs on the dry rations were ascertained at intervals up to about 3 weeks.

Raising fur rabbits, R. G. HODGSON (*Toronto 2: Fur Trade Jour. Canada*, 1944, 2 ed., pp. 148, about 35 illus.).—A revised edition.

Nutritive evaluation of defluorinated phosphates and other phosphorus supplements.—II, Defluorinated phosphates as phosphorus supplements for chicks, H. R. BRD, J. P. MATTINGLY, H. W. TITUS, J. C. HAMMOND, W. L. KELLOGG, T. B. CLARK, C. E. WEAKLEY, JR., and A. H. VAN LANDINGHAM. (Md. and W. Va. Expt. Stas. and U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 28 (1945), No. 1, pp. 118-129).—According to this second article of the series (E. S. R., 94, p. 2), "three laboratories cooperated in determining the effectiveness of 10 different samples of phosphatic materials as sources of phosphorus for bone formation in growing chickens. The samples tested included 6 of defluorinated superphosphate and 1 each of defluorinated phosphate rock, phosphate slag, calcium pyrophosphate (beta), and vitreous calcium metaphosphate. The effects of these materials on percent of bone ash and on growth were compared with the corresponding effects of tricalcium phosphate and of bonemeal. Judged by effect on bone ash, 1 sample of defluorinated superphosphate was almost completely unavailable, and its availability was not increased by finer grinding; the other 5 samples were available but less so than bonemeal and tricalcium phosphate. Defluorinated phosphate rock, phosphate slag, and vitreous calcium metaphosphate were intermediate in availability between the superphosphates on the one hand and bonemeal and tricalcium phosphate on the other. The calcium pyrophosphate was totally unavailable or nearly so. The parallelism between availability and solubility in 0.25 percent hydrochloric acid at 38° C. was such that determination of solubility could be used as a quick, approximate measure of availability. At levels equivalent in phosphorus content to 2 percent

of bonemeal, each of the supplements fed in the one experiment of 8 weeks' duration appeared to have a detrimental effect on growth. The metaphosphate had an unfavorable effect on growth even when fed at a level equivalent to 1 percent bonemeal."

A simple scoring system for estimating "meat type" of live poultry, E. W. HENDERSON (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 1, pp. 75-81, illus. 6).—A scoring system for estimating meat type in live poultry at 24 weeks of age by handling is described and illustrated. Comparisons of the scores of approximately 10 chickens of 3 purebred and 2 crossbred groups with the same birds after plucking resulted in a highly significant correlation of 0.82. The time required for scoring was about 10 sec. per bird.

DAIRY FARMING—DAIRYING

Relation of production of dairy cows to the nutrients fed, F. B. HEADLEY. (Univ. Nev.). (*Jour. Anim. Sci.*, 4 (1945), No. 4, pp. 367-372, illus. 2).—The production of milk at any feeding level may be estimated by logarithmic method when the production of the group of cows at any feeding level is known. The accuracy of the method is compared with the straight-line method and the curve of diminishing returns. The straight-line method was not sufficiently accurate if a single equation is formulated for all groups for which data were given by Jensen et al. (E. S. R., 88, p. 116). Determination of any group at several feeding levels must be made before the full curve of diminishing returns can be calculated. Estimates of production at any feeding level can be made from the mantissa of the logarithm of the total digestible nutrients fed above maintenance plus a constant.

High-fat dairy rations give higher milk production, J. K. LOOSLI and L. A. MAYNARD. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, pp. 3, 4).—Data are cited which indicate that, as an average within reasonable limits, "the more fat a concentrate mixture contains the better it is because it furnishes more total digestible nutrients per pound."

VETERINARY MEDICINE

Meddelanden från Veterinärhögskolan i Stockholm, årgång 17, 1943 (Collected papers from the Veterinary Institute, Stockholm, year 1943) (*Stockholm: Vet. Högsk. Meddel.*, 1943 [about 170 pp., 20 illus.]).—This collection of separates from various sources brings together 10 papers on veterinary science as follows: Några iakttagelser i samband med sulfonamidterapi hos hund [Observations on Sulphonamide Therapy for the Dog], by I. Alström (pp. 357-367, Eng. abs. pp. 366-367); Ett fall av listerellos hos hare (A Case of Listerellosis in the Hare), by T. Henricson (pp. 9, Eng. abs. pp. 7-8); Om pasteurellos hos vilda djur i fångenskap [Pasteurellosis in Wild Animals in Captivity], by A. Hjärre and V. Sahlstedt (pp. 325-339, Ger. abs. pp. 337-338); Undersökningar på förekomst av infektionsämnen och trikiner hos råttor [An Investigation of the Possible Spread of Trichinosis by Rats], by G. Hülphers and T. Henricson (pp. 197-220, Eng. abs. pp. 215-220), in which the rat "is considered not to be of any importance as a spreader of trichina"; Genuin epilepsi hos nötkreatur [True Epilepsy in Cattle], by A. Isaksson (pp. 27, Eng. abs. pp. 23-25), in which the author concludes that it may be "advisable to remember that it actually seems as though the disease may occur in cattle"; Om menisksador hos hund [On Meniscus Injury in the Dog], by F. Nilsson (pp. 133-154, Ger. abs. 151-152); Bidrag till kännedomen om förlossningsfångens etiologi och patogener [The Etiology and Pathogenesis of Foaling Laminitis], by N. Obel (pp. 41-49, Eng. abs. pp. 48-49); Ett fall av brucellos hos häst (A Case of Brucellosis

in the Horse), by L. Olsson (pp. 228-234, Eng. abs. p. 233); Plötsliga dödsfall hos häst och deras samband med fokalinfektioner [Sudden Deaths in the Horse and Their Connection With Focal Infections], by S. Rubarth (pp. 16, Ger. abs. p. 15); and Orienterande undersökningar angående blodfosfatasreaktionens värde för klinisk diagnostik vid mineralbristsjukdomar hos svin [Investigations of the Value of the Blood Phosphatase Reaction for Clinical Diagnosis of Mineral Deficiency Diseases in Pigs], by H. Sandstedt and K. Sjöberg (pp. 641-658, Ger., Eng. abs. pp. 656-657).

Meddelanden från Veterinärhögskolan i Stockholm, årgång 18, 1944 (Collected papers from the Royal Veterinary Institute, Stockholm, year 1944) (Stockholm: Vet. Högsk. Meddel., 1944 [about 400 pp., 60 illus.]).—This collection of papers is similar to that noted above, and includes the following articles of interest to veterinary medicine, as well as others of primary interest to genetics and animal husbandry: Om digestionen i våmmen särskilt med tanke på skravelsjuka och aseptikemiska sjukdomar hos kalv (On Digestion in the Rumen, Especially With Regard to Emaciation (Skravelsjuka) and Asepticemic Diseases in Calves), by H. Hedström and S. Hoflund (pp. 513-533, Eng., Ger. abs. pp. 528-530); Knott (Simulium) som sjukdomsorsak hos våra husdjur [The Gnat (Simulium) as a Cause of Sickness in Domestic Animals], by G. Matsson, F. Ossianilsson, and S. Rubarth (pp. 603-629, Eng., Ger. abs. pp. 625-627); Nagra fall av meniskskador hos häst och nötkreatur [Meniscus Injury in Horses and Cattle], by F. Nilsson (pp. 325-338, Eng. abs. pp. 335-336); and Vattenbelastningsprov som hjälpmedel i den kliniska diagnostiken [The Water-Loading Test as an Auxiliary Method in Clinical Diagnosis], by S. Nilsson (pp. 26-52, Eng. abs. pp. 50-51).

Malattie infettive degli animali domestici [Infectious diseases of the domestic animals], P. STAZZI and A. MIRRI (Milano: Ist. Editoriale "Cisalpino." [1945], 8. ed., rev. and enl., pp. 470+, illus. 104).—This is a general treatise.

Determination of the pathogenicity of aerobes, revised by G. H. CHAPMAN (Pure Cult. Study Bact., 13 (1945), No. 4 [Leaflet 7, 4. ed.], pp. 1-16).—The scope of this leaflet is restricted to methods for animal inoculation, recovery of the organisms injected, and the pathogenic properties of aerobic microorganisms. The topics discussed include the use of laboratory animals, methods of injection, autopsy findings, factors interfering with the determination of pathogenicity, and the use of biochemical methods in lieu of animal inoculation tests. Over 50 references are included.

Observations on the resistance of anthrax spores to heat, C. D. STEIN and H. ROGERS. (U. S. D. A.). (Vet. Med., 40 (1945), No. 12, pp. 406-410, illus. 1).—A series of experiments was carried out to determine the resistance of anthrax spores to moist and dry heat, using methods commonly employed by laboratories for routine sterilization but exposing the spores to heat for a much shorter period than is generally the practice.

In exposure to heat in a water bath, spores from one strain suspended in physiological saline resisted 80° C. for 5 to 30 min., but were destroyed in at least 2 min. at 99° to 100° and in 1 to 30 min. by plunging immediately into boiling water. Numerous spores from a second strain resisted 80° for 30 min., only a few spores survived at 98° to 99° for 2 or 3 min., and none survived after vigorous boiling for 2 min.

In the Arnold steam sterilizer at 100° to 101°, the spores from 31 strains were destroyed in from 5 to 15 min., but at 90° to 91° the spores from only 6 of 12 strains were destroyed in 60 min. In the autoclave at 15 lb. pressure (120°) the spores from 31 strains were destroyed in from 5 to 15 min.

By vigorous boiling the spores from 43 different strains were destroyed in 3 to 5 min.

Dry spores from 30 different strains were destroyed by dry heat at 149° to 150° in 60 min. The dry spores from 12 strains resisted dry heating at the same temperature for 30 min.

The aetiological agent of a peculiar form of encephalitis, N. I. KHODUKIN and M. N. SOSHENIKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 47 (1945), No. 5, pp. 379-381*).—An epidemic which broke out in Tashkent in the winter of 1942-43 and caused high mortality was studied. Following tests with mice it was ascribed to a virus pathogene for man, but differing considerably from both the aestivo-autumnal and the tick-borne verno-aestival types of encephalitis prevalent in the Far East.

Salmonella cultures which resemble the Sendai type, P. R. EDWARDS and A. B. MORAN. (Ky. Expt. Sta.). (*Jour. Bact., 50 (1945), No. 3, pp. 257-260*).—"Salmonella cultures isolated in the United States which have the antigenic formula (I), IX, XII: a-1,5 . . . are culturally, biochemically, and serologically different from Japanese cultures of *S. sendai* which have the same formula. Since these differences are constant and uniform it is suggested that the American strains be designated as *S. miami*."

Active immunisation as against passive segregation with reference to tuberculosis, S. G. TIPPETT (*Vet. Jour., 101 (1945), No. 12, pp. 259-262*).—The author argues that efforts should be made to build up the resistance of cattle to infection by the tubercle bacillus by breeding "only from those cattle that were known to have a very high degree of resistance to tuberculosis" and in addition to cease "to overwork our cows by making them into mere machines for milk production."

[Miscellaneous nematode studies]. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 12 (1945), No. 1, pp. 2-6, 19-26*).—Included in these pages are the following: The Distribution of *Pseudostertagia bullosa* and Some New Records of Nematodes from Pronghorn Antelope (*Antilocapra americana*), by J. T. Luckner and G. Dikmans (pp. 2-4); Some Chemotherapeutic Test in Canine Filariasis (*Dirofilaria immitis*), by P. C. Underwood (pp. 4-6), in which some of 11 organometallic drugs showed significant action against either adult worms or the microfilariae of *D. immitis*; Anthelmintic Studies with Some Thymol-like Compounds (pp. 19-24), in which it was deemed possible that isothymol may compare favorably with other canine ascaricides; and Methyl Chloroform as an Anthelmintic (pp. 24-26), indicating that this drug may compare favorably with other anthelmintics for dogs, both by F. D. Enzie.

Weeds poisonous to livestock, R. B. HARVEY, A. H. LARSON, R. H. LANDON, W. L. BOYD, and L. C. ERICKSON (*Minnesota Sta. Bul. 388 (1945), pp. 40, illus. 21*).—A large number of weeds are discussed, for the most part as to toxicology, symptoms, first aid, general appearance, and control.

Livestock poisoning by *Crotalaria spectabilis*, P. L. PIERCY and L. L. RUSOFF (*Louisiana Sta. Cir. 36 (1945), pp. 4, illus. 1*).—This is a popular account based in part on work previously noted (*E. S. R., 92, p. 700*). It is pointed out that while this species is not highly palatable it is eaten on overgrazed pastures or when more palatable forage is not available. It is poisonous to cattle, horses, mules, sheep, hogs, chickens, and turkeys, none of which should have access to it in any form or at any stage of its development.

The use of hormones in veterinary medicine, J. F. SYKES, C. F. CAIRY, C. F. CLARK, C. L. COLE, B. R. BURMESTER, C. F. HUFFMAN, and C. A. HOPPERT (*M. S. C. [Mich. State Col.] Vet., 5 (1945), No. 2, pp. 62-65, 82, 84, illus. 1*).—This is a topical compilation of data.

Streptomycin—origin, nature, and properties, S. A. WAKSMAN and A. SCHATZ. (N. J. Expt. Stas.). (*Jour. Amer. Pharm. Assoc., Sci., Ed., 34 (1945), No. 11, pp. 273-291, illus. 3*).—This review indicates that, in vivo, "streptomycin has success-

fully controlled experimental infections due to *Salmonella schottmülleri*, *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Shigella gallinarum*, *Brucella abortus*, *Klebsiella pneumoniae*, *Pasteurella tularensis*, and *Mycobacterium tuberculosis*. Against the Gram-positive *Diplococcus pneumoniae* and *Staphylococcus aureus*, protection was afforded by somewhat larger doses. Streptomycin has also protected against spirochaetal infections due to *Borrelia novyi* and *Leptospira icterohaemorrhagiae*. It is not effective in suppressing avian malaria or in the control of the few virus diseases tried. . .

"To date, streptomycin has been administered for infections of the urinary tract, typhoid, brucellosis, *Klebsiella* infections, tularemia, tuberculosis, and wounds. Although the results in some cases have been very encouraging, in others, such as brucellosis and tuberculosis, no definite conclusion may as yet be drawn. In view of the limited clinical data, a final evaluation of the therapeutic potentialities of streptomycin is impossible at the present time."

Stomach-tube feeding of small laboratory animals, D. LEHR (*Jour. Lab. and Clin. Med.*, 30 (1945), No. 11, pp. 977-980, illus. 2).—A simple "hairpin" gag is described which permits rapid and safe stomach-tube feedings of full-grown rats by a single person. With assistance and some experience, 60 rats can be intubated in 30 min.

The bactericidal action of bovine blood for *Brucella* and its possible significance, I. F. HUDDLESON, E. E. WOOD, A. R. CRESSMAN, and G. R. BENNETT. (Mich. Expt. Sta.). (*Jour. Bact.*, 50 (1945), No. 3, pp. 261-277).—This study was undertaken to determine the relationship between in vitro bactericidal action, as shown by plasma and serum from the calf and cow, and resistance to brucellosis infection. A few of the important factors studied were the rate of bactericidal action, the differences in action between serum, plasma, and whole blood, the effect of the time interval between bleeding and setting-up tests, the differences in the species of *Brucella* and the state (smooth or rough) of the culture, the number of organisms used in the test, the effect of diluting serum or plasma, the age of the culture, the effect of filtration and type of filter on the action of serum or plasma, and the effect of heat on the action of serum or plasma.

As a result of these studies, it is pointed out that several factors influenced the results of an in vitro test for measuring the bactericidal action of bovine blood for *Brucella*. "Blood plasma from normal calves and cows possesses a complex which kills large numbers of *B. abortus* in vitro. Serum possesses the same property, but to a lesser extent. The bactericidal complex does not make its appearance in calf blood to any extent until after the ingestion of colostrum. Blood plasma from cows infected with *B. abortus* possess a property which inhibits the killing action of the bactericidal complex for *Brucella*. *Brucella*-infected cows may be detected and distinguished from those not infected by making use of differences shown in the bactericidal action of their plasma for *Brucella*. The serial dilution method reveals greater differences in the bacterial-growth-inhibiting action of plasma from normal and *Brucella*-immune cows. Such differences suggest that specific bactericidal antibodies, if present in sufficient concentration, play an important role in the protection of cattle against brucellosis."

Recent progress concerning bovine trichomoniasis, B. B. MORGAN. (Wis. Expt. Sta.). (*M. S. C. [Mich. State Col.] Vet.* 4 (1944), No. 4, pp. 161-164, illus. 1).—This review deals especially with diagnosis, immunity, cultural media, and H-ion concentration.

The diagnosis of bovine trichomoniasis, B. B. MORGAN. (Wis. Expt. Sta.). (*M. S. C. [Mich. State Col.] Vet.*, 5 (1945), No. 2, pp. 49-53, 82).—This is a practical discussion of methods.

Liver flukes in cattle and how to control them by medication, O. W. OLSEN (U. S. Dept. Agr., Bur. Anim. Indus., 1944, pp. 5, illus. 1; also in *Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 3, pp. 9-11, illus. 1).—A description of the injury caused by liver flukes, their mode of transmission, and their control in cattle by spring and fall drenching with hexachlorethane. The reprint is accompanied by a notation of later successful herd treatments and directions for a simpler method of mixing the hexachlorethane (8 lb.) with bentonite (12 oz.), white flour (2 teaspoonfuls), and water (1.5 gal.).

Tick paralysis in beef cattle due to *Dermacentor andersoni*, O. H. MUTH. (Oreg. Expt. Sta.). (*North Amer. Vet.*, 26 (1945), No. 11, p. 668).—An outbreak among 186 yearling Angus steers on spring range is described as the first to affect a considerable number of cattle in Oregon. General paralysis of varying degree was encountered in about 30 animals. A severe tick infestation was revealed in various parts of the body, with some solid masses of ticks as large as a man's hand present on the dewlap. Removal of the ticks with knives and an electric clipper, and the use of a drench of cane molasses in water with the most severely affected animals, resulted in prompt recovery and no recurrence of the paralysis on return of the steers to the original pasture after a week's absence, although scattered ticks could still be observed. Ticks collected from some of the steers were identified as *D. andersoni*. See also a note by Hadwen (*E. S. R.*, 30, p. 182).

Diseases of lambs encountered in Oregon, O. H. MUTH. (Oreg. State Col.). (*M. S. C. [Mich. State Col.] Vet.*, 5 (1945), No. 2, pp. 66-68, 84).—This is a popular review.

Power dusting for control of sheep tick on feeder lambs, H. H. SCHWARDT. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [N. Y. State and Cornell Stas.]*, 11 (1945), No. 4, pp. 4-5, illus. 1).—Experiments were undertaken to determine the feasibility of power dusting for the control of sheep ticks on the feeder lambs shipped into western New York each fall for fattening. The weather is then too cold for dipping, and hand dipping is a slow and disagreeable task. During the fall and winter of 1944, 22 flocks totaling 6,939 feeder lambs were dusted with either rotenone or DDT, applied with a 5-hp. crop duster, and observed for 4 mo. The apparatus included a 16-ft. chute of portable fencing and special tubes to insure dusting the under sides of the lambs.

A marked reduction in infestation was obtained with all the rotenone dusts, but a 1-10 mixture with motor oil added gave the best results. This mixture caused a mortality of more than 90 percent within 2 days, and reinfestation during the 3-mo. feeder period was negligible. In addition to increasing the effectiveness of the dust, the oil apparently weighted the mixture so that a much smaller dust cloud formed around the machine. Irritation to the eyes and throats of the operators was thereby reduced. The 1-10 rotenone formulations without oil produced initial mortalities of less than 80 percent, but all of them had reduced the ticks by more than 90 percent 2 weeks after dusting.

The 1-20 rotenone dust killed only 65 percent of the ticks in 2 days, and the mortality count was still unsatisfactory after 49 days.

After 2 days, the 5 percent DDT dust had killed only 7 percent of the ticks, and after 24 days the mortality had risen only to 22 percent. At 100 days after dusting, the flock dusted with DDT was nearly as heavily infested as were the check flocks.

Tick control was always higher in the flocks with very greasy wool. When the wool was wet, dust penetration was poor and the control obtained was correspondingly low.

The cost of power dusting was found to be lower than that of dipping, it could be done rapidly, and the labor required was much less than for dipping. Materials cost about 1 ct. a head and during 1 day of the tests, 1,400 lambs were dusted in 6 hr.

Tests with carbon tetrachloride, hexachlorethane, and tetrachlorethylene for removing the fringed tapeworm of sheep, O. W. OLSEN and R. W. ALLEN. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 12 (1945), No. 1, p. 2).—These tests with sheep gave no indication of any anthelmintic action on the fringed tapeworm in the liver or small intestine.

Swine brucellosis, L. M. HUTCHINGS. (Ind. Expt. Sta.). (*M. S. C. [Mich. State Col.] Vet.*, 4 (1944), No. 2, pp. 68-69, 86).—This discussion includes data from experiments at the Indiana Station on methods of spread, susceptibility, diagnosis, and control.

Worm parasites in swine raised under a moderate degree of sanitation, J. S. ANDREWS and J. W. CONNELLY. (U. S. D. A.). (*Helminthol. Soc. Wash. Soc.*, 12 (1945), No. 1, pp. 6-12).—Findings were briefly summarized of post-mortem examinations made during 1941-43 of 129 hogs from the herd of the Georgia Coastal Plain Station. One objective was to determine to what extent the management practices utilized in raising the hogs were instrumental in controlling the intestinal nematodes common in swine in this region.

Hookworms (*Crassisoma urosulatum*), one species of lungworm (*Metastrongylus salmi*), and the red stomach worm (*Hyostrongylus rubidus*) were not found in pigs maintained after weaning on temporary pastures. The kidney worm (*Stephanurus dentatus*) was not found to have invaded the kidneys and kidney fat of these animals. The incidence of ascarids (*Ascaris lumbricoides* var. *sis*), thornheaded worms (*Macracanthorhynchus hirudinaceus*), two species of lungworms (*Metastrongylus elongatus* and *Choerostongylus pudendotectus*), a spirurid stomach worm (*Physoccephalus sexalatus*), and two species of nodular worms (*Oesophagostomum longicaudum* and *O. brevicaudum*) was lower in the pigs raised at the station than has been reported in farm-raised pigs in this region. However, one species of spirurid stomach worm (*Ascarops strongylina*), the intestinal threadworm (*Strongyloides ransomi*), one species of nodular worm (*O. dentatum*), and the whipworm (*Trichuris suis*) occurred more frequently in the pigs examined than has been reported from farm-raised pigs in this region.

"The moving of pigs to clean ground at frequent intervals during the process of 'hogging-off' crops during the summer season was associated with an absence of lungworms, and with a reduction in the severity of infections with all other species of parasites found except nodular worm, whipworms, intestinal threadworms, and kidney worms. These exceptions may be explained on the basis of favorable conditions for infection during the suckling period provided by the permanent farrowing lots."

Trials with sodium fluoride as an ascaricide for swine, R. W. ALLEN. (U. S. D. A.). (*North Amer. Vet.*, 26 (1945), No. 11, pp. 661-664).—These investigations were designed to provide additional information (E. S. R., 93, p. 772; 94, p. 258) as to the efficacy of sodium fluoride for the removal of ascarids. In 6 tests, each involving 10 pigs in pairs and receiving the chemical as 1 percent of the feed for one or two days, the percentages of ascarids expelled were, respectively, 55, 97, 86, 96, 79, and 95, with an average of 88.9 percent. In a seventh test with 10 pigs to ascertain the amount of spontaneous elimination of ascarids, 28.8 percent were eliminated. No untoward symptoms definitely attributed to the sodium fluoride were observed.

A review of the epizootiology of equine encephalomyelitis in the United States, M. S. SHAHAN and L. T. GILTNER. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 108 (1945), No. 824, pp. 279-288, illus. 2).—In this review, it is estimated that at least 1,000,000 horses and mules have developed infectious equine encephalomyelitis in the United States since 1930. Possibly as many as 300,000 of these animals have died.

Certain epizootiological features of the disease are discussed. The evidence concerning vectors is reviewed.

Summaries of the present known and probable distribution of the western and eastern types of the virus are presented. Eastern virus was isolated in 1944 from cases occurring in Louisiana and Missouri, bringing the number of States so involved to 15. Western virus has been identified in 19 States and both types have been found in three States.

All but three States have reported cases of the disease during the period 1935 through 1944. In 14 States, the disease has been diagnosed on one or more occasions during this interval, but the virus has not been specifically identified as to type.

Control, through the medium of vaccination and other possible means, is discussed. The desirability of laboratory diagnosis, including isolation and typing of virus wherever possible, is stressed.

Gli attuali metodi di difesa dalle più comuni malattie del pollame e dei conigli [Control methods for the common diseases of poultry and rabbits], G. VIANELLO ([Milano]: Ist. Sieroterapico Milanese Serafino Belfanti, 1944, pp. 63, illus. 41).—A popular account of these diseases and their control.

Sensibilité de *Pasteurella avicida* à l'action bactericide des sulfamides [Sensitivity of *P. avicida* to the bactericidal action of the sulfonamides], N. STAMATIN, V. GEORGESCO, and S. LUSCALOV (*Ann. Inst. Pasteur*, 71 (1945), No. 7-8, pp. 250-263).—Preliminary tests with pigeons and in vitro revealed a specific action of sulfathiazole against the infections caused by *P. avicida*. On chickens, it showed a high anti-infection value overcoming, in a dose of 0.25 gm. given per os simultaneously with the culture, an inoculation of 0.01 cc. Doses of 0.5 gm. but not of 1 gm. were tolerated fully. However, the sulfonamides are eliminated very quickly by poultry, so that the duration of the resistance conferred was not over 2 days. The intramuscular use of immune serum proved superior to that of the sulfonamides both as to absence of toxicity and preventive value, but the immunity conferred was not lasting and for the prophylaxis of fowl cholera the sulfonamides are thought to offer some advantages.

The rate of action of sulfadiazine and quinine on the malarial parasite, *Plasmodium gallinaceum*, S. BRACKETT, E. WALETZKY, and M. BAKER (*Jour. Pharmacol. and Expt. Ther.*, 84 (1945), No. 3, pp. 254-261, illus. 2).—Tests with sulfadiazine on *P. gallinaceum* in chickens showed that high levels did not completely suppress the growth of the parasite for at least 2.5 to 3 days, whereas quinine completely inhibited growth and development of the parasites almost immediately in four out of five birds. It was found also that sulfanilamides may act slowly in sporozoite-induced infections, since more than 2 days of treatment were required for maximum effects. It is suggested that the length of time required by effective inhibition by sulfanilamides and other slowly acting compounds increases as the growth rate of the organism decreases, and that this may have practical implications in chemotherapeutic trials.

Chilling as a means of retaining the viability of the sporozoites of *Plasmodium gallinaceum*, S. BRACKETT and C. O. HUGHES (*Jour. Parasitol.*, 31 (1945), No. 4, pp. 288-289).—A procedure is described whereby more uniform infections of chickens by the sporozoites of *P. gallinaceum* were obtained by chilling the ground infective material from *Aedes aegypti* mosquitoes as soon as possible and keeping it in an ice bath during the periods of inoculation. There was also a marked increase in the virulence of the inoculum due to chilling.

An analysis of the predominating causes for mortality among White Leghorn chickens, E. P. JOHNSON. (Va. Expt. Sta.). (*M. S. C. [Mich. State Col.] Vet.*, 4 (1944), No. 4, pp. 168-171, illus. 1).—This analysis covers 1,432 birds examined over a 3-yr. period.

Further investigations of the transmission of fowl paralysis (neurolymphomatosis) by direct transfusion, A. J. DURANT and H. C. McDUGGLE (*Missouri Sta. Res. Bul.* 393 (1945), pp. 18, illus. 5).—In this continuation of earlier work (E. S. R., 82, p. 258), fowl paralysis was readily produced in White Leghorn chicks by an intravenous technic. Donors hatched from visibly affected hens were used, chicks 23 and 50 days old producing a high incidence of fowl paralysis and chicks 33 days old only a few cases. In another series donors were bled every day from 1 day to 20 days of age, and from 11.11 to 68.75 percent of inoculations were secured. Visibly affected birds near 6 mo. of age were found to be suitable donors, and 1 cc. of virus-containing blood was sufficient to induce the disease in a high percentage of recipients. White Leghorn chicks 1 to 4 days of age were quite receptive to the virus, but White Wyandotte chicks of the same age were very refractory. A rather high percentage of apparently healthy birds showed gross nerve involvement, and this condition was found definitely associated with a characteristic soiling of the feathers just under the lower beak along the throat, cervical, and crop region. Of a total of 26 selected birds with soiled fronts, 17 showed definite evidence of fowl paralysis on autopsy.

Additional studies on the life cycle of *Capillaria caudinflata*, a nematode parasite of chickens and turkeys, E. E. WEHR and R. W. ALLEN. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 12 (1945), No. 1, pp. 12-14, illus. 1).—This study revealed that the earthworm *Eisenia* (H.) *foetida*, as well as *Allolobophora* (*Helodrilus*) *caliginosa*, served as an intermediate host for *C. caudinflata*.

Phenothiazine and nicotine-bentonite as an anthelmintic in turkeys, P. D. HARWOOD and D. I. STUNZ (*Helminthol. Soc. Wash. Proc.*, 12 (1945), No. 1, pp. 1-2).—In tests with two flocks of six turkeys weighing from 8 to 16 lb. each, and receiving per flock a mixture of 4 lb. of poultry mash, 12 gm. of nicotine-bentonite, and 6 gm. of phenothiazine, 69.6 and 42.9 percent of the *Ascaridia* and 95.9 and 99.7 percent of the *Heterakis* were removed from the two flocks. The species of *Ascaridia* encountered were identified as *A. dissimilis*, said to be the first record in turkeys, with none of *A. galli*.

An infectious enteritis of young turkeys associated with *Cochlosoma* sp., J. G. CAMPBELL (*Vet. Jour.*, 101 (1945), No. 12, pp. 255-259, illus. 6).—An acute infectious disease of young turkeys indistinguishable from infectious catarrhal enteritis due to *Hexamita* sp. (hexamitiasis) is recorded, and is believed in this instance to be due to a flagellate protozoan belonging to the family *Trichomata* and the genus *Cochlosoma* Kotlán. The main features of the morphology of the flagellate are recorded, and its dimensions compared with some other known species. It is emphasized that a diagnosis of this disease can only be made with perfectly fresh warm material, as the flagellates die and disappear within a few hours of the death of the host.

The effects of penicillin on *Erysipelothrix rhusiopathiae* infected pigeons, L. VAN ES, J. F. OLNEY, and I. C. BLORE (*Nebraska Sta. Res. Bul.* 141 (1945), pp. 15).—Groups of pigeons were injected intramuscularly with a culture of the causative organism of swine erysipelas and with penicillin either simultaneously or at various intervals. The protective dosage was found to range between 2,400 and 3,600 Oxford units. A significant number of pigeons succumbed when even less than 12 hr. had elapsed at the time of 2,400-unit treatment. When the penicillin treatment was delayed for 48 hr. after the culture inoculations, a high mortality was noted. Simultaneous injection of culture and penicillin was preferred for experiments of this type, and the interval should not exceed 24 hr. Groups injected three or more times survived much more extensively than those receiving only one or two doses.

The experiments were conducted primarily because of their bearing on the treatment of swine, and it is concluded that treatment by the administration of

penicillin may be indicated for swine in the earliest stages of swine erysipelas. The fact that, in order to obtain the best results, repeated penicillin injections seem to be necessary constitutes a considerable limitation on its employment in veterinary practice. Its use may, however, receive consideration in the treatment of erysipeloid in persons who are sensitized to horse serum.

AGRICULTURAL ENGINEERING

Supplemental irrigation for Missouri and regions of similar rainfall, H. RUBEY (*Missouri Engin. Expt. Sta. Bul. 33 (1945), pp. 75, illus. 21*).—The author discusses the possibilities of supplemental irrigation for Missouri and regions of similar rainfall through adaptations of proven and successful irrigation practices elsewhere to Missouri conditions, pointing out the many pitfalls in typical system installations which cause many to fail. A selected list of annotated references on irrigation practices, equipment, and irrigated crops, published largely within the past 10 yr., is also provided as an aid to the prospective irrigator.

Practical land clearing on the Cumberland Plateau, J. J. BIRD (*Tennessee Sta. Bul. 198 (1945), pp. 22, illus. 12*).—A description of the Cumberland Plateau area, its land-clearing problems and justification for agricultural development. The author points out that experimental data on plateau-clearing methods are meager and that there is little agreement among local farmers as to the most practical methods. Results of studies of the local farmer practices and certain experimental data obtained by the station during the years 1943 and 1944 are presented, together with suggested practical land-clearing procedures and implements for immediate row cropping, for pastures, and sprout control, and the utilization of cattle in these operations.

The Ohio power take-off dynamometer and its use for power studies, G. W. MCCUEN (*Ohio Sta. Bimo. Bul. 235 (1945), pp. 119-123, illus. 2*).—The author presents a brief history of the development of the power take-off and its adaptation to farm machinery, together with the development of a dynamometer so designed and built to measure and record the power required to propel and operate a given machine. Using this dynamometer in studies of the power requirements and machine efficiency of combine harvesters, the results indicated four zones of losses: (1) Cutter bar, (2) cylinder, (3) rack, and (4) shoe. Recorded dynamometer data obtained in cutting and threshing tests of four varieties of wheat where varying adjustments were made to those machine parts indicated that proper adjustments by the operator definitely affected the over-all power requirements and machine efficiency.

Studies on use of liquid in tractor tires.—II, Effect on loss of pressure, change of pressure with temperature, bouncing characteristics, and resistance to damage by impact, E. C. SAUVE and E. G. MCKIBBEN (*Michigan Sta. Quart. Bul., 28 (1945), No. 1, pp. 1-19, illus. 20*).—All conditions given are based on experimental results obtained using new tires and do not give information on the cumulative effect of several years use with various percentages of liquid fill (E. S. R., 92, p. 421). Test results indicate that: (1) With temperature reasonably constant, 100-percent liquid-filled tires greatly reduce the rate of loss of pressure by diffusion through the inner tube walls and that for liquid fills other than 100 percent, the most favorable level for minimum loss of pressure by diffusion is one slightly above the top of the rim; (2) temperature changes have greater effect on inflation pressure as the percentage of liquid fill is increased, indicating that periodic adjustments in tire pressure for the 100-percent liquid fill is desirable for maintenance of desirable deflection limits; and (3) bouncing characteristics or shock (tractor frame motions only) caused by vertical acceleration of the axle are larger and greater in number for the 100-percent liquid fill as compared with 90 and 75 percent liquid fill and air only. Axle vibration

period is decreased with an increase of percentage liquid fill. Axle vibration damping out rate increases with an increase of percentage liquid fill on simple ridge crossings. Axle maximum vertical motion increases with increase of percentage liquid fill. In simple change of surface level, axle maximum vertical motion decreases with increase of percentage liquid fill. Actual riding quality is affected by character of seat cushion, seat springs, tire inflation pressures, and other variable factors and are not included in the reported tests. This problem deserves intensive special study on its own account due to its complexities. Resistance to damage by impact or the bruise resistance of tractor tires decreases with increase of liquid fill.

Laying out fields for tractor plowing, C. D. KINSMAN and L. A. REYNOLDS, revised by I. F. REED (*U. S. Dept. Agr., Farmers' Bul. 1045, rev. (1945), pp. 18+, illus. 17*).—Methods and plans suited to both rectangular and irregular shaped fields are discussed in this revision (*E. S. R.*, 41, p. 289).

A device for setting fertilizer distributors accurately and a simple method of calibration, R. E. BLASER. (*Fla. Expt. Sta.*). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 10, pp. 857–858, *illus. 2*).—The author describes and explains the operation of a simple screw adjustment device and metal sampling pan which can be attached to a standard fertilizer distributor to determine accurately the amounts of fertilizer spread over a predetermined soil area. Using these accessories in conjunction with a portable scale, it is possible to check distribution rates in the field with precision.

Sugar-beet harvester trials in Michigan in 1943 and 1944, E. G. MCKIBBEN, R. W. BELL, and L. E. SMITH (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 1, pp. 52–58, *illus. 1*).—A progress report on the performance of four sugar-beet harvesters of a single type during the 1943 and 1944 harvesting seasons. Use of these harvesters on many soil types and under a wide range of soil conditions gave satisfactory results. Under most conditions losses due to unharvested marketable beet tissue left in the field were no greater than average hand topping, and screenings were not excessive except in those cases where harvesting was done in fields too wet for hand harvesting. Further studies are necessary in methods of handling tops and crowns, together with additional planning of field layouts and selection of beet varieties for uniform growth habits. An analysis of costs per acre for mechanical harvesting indicate that they should not exceed \$10 to \$12.

Building with logs, C. F. FICKES and W. E. GROBEN (*U. S. Dept. Agr., Misc. Pub. 579 (1945), pp. 56+, illus. 51*).—The authors present the principles of log construction with the basic assumption that the reader is familiar with the ordinary frame building methods used where wood is the principal construction material. The publication is subdivided into the following subject matter discussions: Building the foundation, preparing the logs, dimensions of the building, framing the corners, door and window jambs, floor joists, laying the wall logs, window and door openings, window and door frames, roof framing, partitions, flooring, interior wood finishing, calking, chinking, chinkless log-cabin construction, hewing timbers, fire-place framing, oiling and painting, the finished structure, furniture, building plans, and additional information.

Preservative treatments of fence posts: 1944 Progress report on the post farm, T. J. STARKER (*Oreg. Engin. Expt. Sta. Bul. 9-F (1945), pp. 8+, illus. 1*).—This is the 1944 progress report on an endurance test set up in 1927 (*E. S. R.*, 87, p. 577).

Moisture retention of packing materials, H. A. LUNT (*Amer. Nurseryman*, 82 (1945), No. 10, pp. 5–6, *illus. 2*).—Studies made at the Connecticut [New Haven] Experiment Station in cooperation with a local nursery of the water retentive power of five packing materials—sphagnum moss, excelsior, wood shavings, scrap artificial sponge, and a mixture of leaf mold and shavings gave the following results: (1) Scrap sponge was least efficient; (2) leaf mold and shavings most efficient; (3) sphagnum moss had the second highest moisture content at the end of 14 days, but

its rate of water loss was the highest of the five tested; and (4) there was little to choose between excelsior and shavings, both of which showed an intermediate performance.

Informe sobre la Construcción de Silos Subterráneos [Information covering the construction of underground silos], J. J. SIÉCOLA (*Uruguay Min. Ganad. y Agr.*, [Pam.] 77 (1945), pp. 66+, about 40 illus.).—A practical discourse on underground silos. Detailed working plans, specifications, bills of materials, costs and labor requirements, with detailed explanatory remarks of each step in the construction of a 550 ton underground silo, are presented.

The development and operation of home and institutional food dehydrators, D. COMIN, W. JUNNILA, and M. B. PATTON (*Ohio Sta. Bimo. Bul.* 235 (1945), pp. 132-147, illus. 9).—The authors review the experimental development of inexpensive, easily constructed dehydrating equipment for processing surplus food products in homes and institutions during the emergency war period. Descriptions of experimental dehydrations devised in these studies are given, together with their experimental operating characteristics. All dehydrator models were fabricated, so far as possible, from noncritical materials, utilizing any fractional horsepower motor with fan to provide air circulation and heating sources of common Mazda-type bulbs, infrared drying lamps, cone-type heaters, or existing steam boilers with column-type used radiators. All driers dehydrated both the fruits and vegetables at a moderate cost for heat, but they required constant attention to maintain proper heat control and to stir the food for rapid, even drying. Inexpensive chicken-brooder thermostat installation reduced the attention necessary for heat control. The greatest operating problem of tissue overheating was overcome by decreasing the amount of air recirculation, allowing more outside air intake which in turn shortened the dehydration time. Dehydration is not deemed as simple as canning, requiring constant attention to the product by the operator. The finished product also is not as yet as palatable as food preserved by other means, and it must at present be considered an emergency method of food preservation in the home.

Steam blanching cabinet for locker plants and community centers, C. W. DuBois and H. T. BARR. (*La. Expt. Sta.*). (*Ice and Refrig.*, 106 (1944), No. 6, pp. 49-50, illus. 2).—A detailed description is given of the conversion of a ready-made electric sterilizer cabinet into a practical steam cabinet used for blanching vegetables prior to dehydration, canning, or freezing.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Ohio station] (*Ohio Sta. Bimo. Bul.* 235 (1945), pp. 124-126, 152, 153).—An article by W. P. Judkins, *Cultural Methods Influence Strawberry Production Costs*, includes tables showing by items the average approximate amounts of labor and materials, and the cost of each operation in the growing of an acre of strawberries up to harvest, 1943-44; the harvesting costs per quart; and the effect of yield per acre on cost per crate; and discusses briefly the effects of cultural methods on costs. Tables by J. I. Falconer show the estimated total tons of different mixed and unmixed feeds reaching the retail trade in Ohio in 1942, 1943, and 1944; and the indexes by years, 1913-44, and by months, January 1944-April 1945, of wholesale prices of all commodities in the United States, Ohio industrial pay rolls 1931-42, prices paid by farmers, farm product prices in the United States, Ohio farm wages, Ohio farm real estate prices, prices of Ohio farm products, and cash income from sales of farm products.

Publications: Department of agricultural economics and rural sociology (*Tennessee Sta. Agr. Econ. and Rural Sociol. Depart. Monog.* 60, rev. (1945), pp.

30+).—This is a revised list of the more important publications of the department (E. S. R., 92, p. 423).

Unpublished manuscripts: Department of agricultural economics and rural sociology (*Tennessee Sta. Agr. Econ. and Rural Sociol. Dept. Monog. 190 (1945), pp. 62+*).—The unpublished manuscripts of the department are listed.

Rural Hunterdon: An agricultural history, H. G. SCHMIDT (*New Brunswick, N. J.: Rutgers Univ. Press, 1945, pp. 331+*, illus. 23).—An agricultural history of Hunterdon County, New Jersey.

Land classification aids veterans buying farms, F. F. HILL. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 11 (1945), No. 4, pp. 8-9, illus. 1*).—This is a brief discussion of land classification on the basis of economic productivity for agriculture and its application in buying farms.

Fruit and vegetable stores as retail outlets for fruit, M. P. RASMUSSEN, F. A. QUITSLUND, and E. W. CAKE. (Coop. U. S. D. A.). ([*New York*] *Cornell Sta. Bul. 815 (1945), pp. 68, illus. 26*).—Facts are presented concerning fruit sales by operators of specialized fruit and vegetable stores in New York City. The data were obtained from the operators of 418 independent fruit and vegetable stores during August and 422 stores during November 1939, and 430 stores during March 1940, covering weekly sales of apples and other seasonal fruits available in substantial volume. The data are analyzed and discussed under the following headings: Relative importance of specialized fruit and vegetable stores, proportion of stores handling each fruit, size of stores and businesses, usual quantities of major fruits handled, canned fruits and juices, gross retail margins, loss or nonprofit sales, retail prices, number of items handled, units of sale, spoilage, credit and delivery services, display and fruit sales, and apple sales—varieties, prices, grades, size of business, etc. Some of the findings follow:

Specialized fruit and vegetable stores in the New York metropolitan area totaled about 3,485 in August 1939, being about 21 percent of all outlets handling fresh fruits and vegetables. Such stores handled one-third of all dollar sales in August, 35 percent in November, and 40 percent in March, the respective percentages of the total tonnage of fruits being 28, 31, and 36. The bulk of the fruit business is concentrated in a comparatively small number of stores. No standard retail margin was observed. There seemed to be no definite or consistent relationship between percentage margins and sales. Largest sales were usually at medium prices. There was no clean-cut relationship between size of business or store and prices charged per pound of various fruits. Almost all consumer purchases of important fruits were in small units. There was no consistent relationship between size of business and spoilage, or pounds of each fruit handled and spoilage per 100 lb. It was by no means the rule for consumers buying the largest quantities of fruit to do so where the lowest prices prevailed. Stores offering credit and delivery services had larger business than those not offering such services. Stores with largest displays of a given fruit usually sold the largest quantities of such fruit.

Hucksters and pushcart operators as retailers of fruit, M. P. RASMUSSEN, F. A. QUITSLUND, and E. W. CAKE. (Coop. U. S. D. A.). ([*New York*] *Cornell Sta. Bul. 820 (1945), pp. 50+*, illus. 21).—Information is presented regarding fruit sales of hucksters and pushcart operators in New York City. The data were collected from 317 pushcart peddlers and 75 hucksters in August and 319 peddlers and 71 hucksters in November 1939, and 292 peddlers and 60 hucksters in March 1940, regarding fruits handled, prices charged, costs, etc. The data are analyzed and discussed under the same headings as in Bulletin 815 noted above. Some of the findings follow:

Pushcart or market-stall operators made up about 20 percent of the retailers of fresh fruit and vegetables in New York in 1939, at least 3,272 or more push-

carts or market stalls being operated. Wagon or motor hucksters formed about 16 percent of the retail outlets, about 2,765 being operated. Pushcart operators handled about 12 percent of the total tonnage sold weekly during August, 9 percent during November, and 7 percent during March. The respective percentages handled by hucksters were 19, 10, and 5. About 29 percent of the hucksters and 60 percent of the pushcart or market-stall operators did less than \$100 worth of business per week. Generally, pushcart or market-stall operators were able to meet the competition of specialized fruit and vegetable stores but were usually outsold by wagon or motor hucksters. No standard or uniform percentage margin was charged by hucksters or pushcart or market-stall operators. Both seemed to aim at obtaining a gross margin of about 1 ct. per pound on fruits handled. Hucksters took slightly higher margins than pushcart peddlers. Wide ranges in prices were observed in the same income areas for the same variety, grade, and size of fruit, both among peddlers and hucksters. Spoilage incurred by pushcart operators was lower for practically all fruits than the average for all retail outlets. Spoilage reported by hucksters was as high as for all outlets during August but lower than the average in November and March.

Michigan farm prices and costs during the war period to 1945. O. ULREY (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 1, pp. 35-44, illus. 4).—The statistical data and analysis of the relationship of prices received by Michigan farmers for products and paid for items entering into production cost of farm products (E. S. R., 89, p. 598) are brought up to date.

Prices following wars. F. A. PEARSON, W. I. MYERS, and J. H. LORIE (Cornell Univ.). (*Appraisal Jour.*, 13 (1945), No. 4, pp. 329-338, illus. 1).—The price movements in the United States following the War of 1812, the Civil War, and World War I, and in England, Italy, Finland, and Germany following World War I are discussed.

Index numbers of production, prices, and income. J. I. FALCONER (*Ohio Sta. Bino. Bul.* 236 (1945), p. 173).—The data noted on page 526 are extended to include the period May-June 1945.

RURAL SOCIOLOGY

Population trends in Minnesota, 1940. L. NELSON and H. CLAMPITT (*Minnesota Sta. Bul.* 387 (1945), pp. 39, illus. 28).—This represents in part a revision of Bulletin 327 (E. S. R., 76, p. 415), but has been mostly rewritten to incorporate data from the 1940 census. In 1940 it appeared that the State was approaching a rather stationary population. As in the United States in general, the population has gradually shifted from predominantly rural to predominantly urban. The rate of birth is now near the national average. The trend toward fewer young and more old people has great significance to the social institutions of the State, particularly the schools and welfare organizations. Migration from farms to towns and cities is seriously upsetting the ratios of the sexes, creating a deficit of males in the cities and a vast surplus in the country.

Rural children and youth in Ohio. A. R. MANGUS (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul.* 185 (1945), pp. 57+, illus. 4).—According to this analysis of 1940 census and other data, both the numbers and proportion of children in the Ohio farm population declined greatly during the two decades ended in 1940 as a result of declining numbers of births. Nevertheless in 1940 the farm population still contained relatively more children than did the general population because reproduction rates continued much higher in rural than in urban areas. Since 1940 the volume of births has risen to an all-time peak in Ohio due to the impact of the war, but the farm population has not shared much if at all in the rise due to great shortages of young women in the most fertile child-

bearing period of life. Even before the war the farm population had a comparatively low percentage of its population in the ages 20-40, and contained a very great excess of males over females, particularly in the ages 18-30. There was an exceedingly large number of bachelors and an unexpectedly large number of spinsters. Many farm youths who marry find their marriages unsuccessful, as indicated by considerable numbers of divorces and separated persons living on farms. Young farm women had on the average received more formal schooling than had young men. Farm youths had less formal schooling than did urban youths of comparable ages. Birth rates per 1,000 rural young women were highest in the economically poorest areas of Ohio and were lowest in the better areas. Death rates among children and youths in Ohio were highest in towns and small cities and in rural areas and were lowest in the large cities. During the war and up to February 1944, Selective Service rejection rates for all registrants examined in Ohio varied from 27 percent in January 1943, to 43.8 percent in January 1944, and were higher in farmers than in most major occupational groups.

Utah housing in its group and community aspects, J. A. GEDDES and C. D. FREDRICKSON (*Utah Sta. Bul.* 321 (1945), pp. 90+, illus. 35).—This study constitutes an appraisal of housing conditions that exist among the chief rural farm and nonfarm groups in the communities studied. Comparisons are made between Utah and other States, between counties of Utah, and between four northern Utah communities, each of a different type. The data include the house, home conveniences, the automobile, the streets adjoining the house, newspapers, magazines, books, and connection with water, sewer, power, and telephone lines. The groups are segregated by the vocation, farm and nonfarm, from which the living is made. The purpose of the inquiry was to find out how successful the different vocational groups living in different types of communities have been over the years in providing satisfactory homes for their families.

"The composite average of 17 items pertaining to good housing shows the village farmer to be more favorably situated than the farm dweller in all four villages. The edge-of-village farm house is superior to both the farm dweller and village farm houses at Plain City, Mendon, and Lewiston. It is inferior to the village farm home at Tremonton. Nonfarm housing is both better and not as good as farm housing. . . . In general, the professional and business groups are the best housed and the farm laborers and the unskilled workers are the poorest housed in the four villages.

"The general picture of housing in rural Utah, as shown in this study, is one of considerable inequality. Among the numerous poorly housed no minimum group or social standard prevails. Neither through government nor through cooperatives has any appreciable influence shown itself in behalf of the poorest one-third of the population. In only one community of the four studied has the Government, through FHA, entered as an important influence, and in this town it is not the poorer groups who have been aided. Farm credit has not yet organized a housing division for farm people."

Better health for rural America (*U. S. Dept. Agr., Misc. Pub.* 573 (1945), pp. 34+).—This is a discussion of the main problems of rural health services, with suggestions for their improvement as formulated by the Department of Agriculture's Interbureau Committee on Postwar Programs.

Public library service for Michigan rural residents, C. R. HOFFER (*Michigan Sta. Quart. Bul.*, 28 (1945), No. 1, pp. 66-74, illus. 2).—This is a discussion of the public library services available to residents of rural Michigan. "As matters now stand, almost one million people are without any public library service and of this number 96.5 percent are rural residents."

Farm women and the farm cooperatives, W. A. ANDERSON. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4,

pp. 11-12, *illus. 1*).—As previously noted (E. S. R., 93, p. 508), the author believes that the cooperatives are overlooking a valuable source of support. As a result of interviewing farm women representing 544 homes in three communities, the major finding was that the farmer's wife knows little about cooperatives and is not an active participant in their work. These organizations are dominated by men.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

What is farming? G. E. LARSON and W. M. TELLER (*New York: D. Van Nostrand Co., 1945, pp. 410+*, *illus. 16*).—"What Is Farming?", originally prepared for the United States Armed Forces Institute, was revised and adapted for civilian use with the consent of the War Department." The material is presented under parts as follows: Part 1, Farming as a Living and as a Way of Life, with chapters on what it takes to be a farmer, the farm as a place to live, and the farm as a business; part 2, The Base of All Agriculture, with chapters on climate and topography, soil and water, the living plants, and the plants that support us; part 3, Kinds of Farming, with chapters on major types of farming in the United States, part-time farming, vegetables in big and little gardens, fruits that grow on bushes and trees, modern farm animals, poultry, farm forestry, and unusual kinds of farming; part 4, Building and Tools; part 5, Planning and Managing; and part 6, The Opportunities and Getting Started.

FOODS—HUMAN NUTRITION

Tables of food composition in terms of eleven nutrients (*U. S. Dept. Agr. Misc. Pub. 572 (1945), pp. 30+*).—This comprehensive compilation lists the average values in terms of calories, protein, fat, carbohydrate, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid for 275 different foods. Data for proximate constituents were taken chiefly from U. S. D. A. Circular 549, Proximate Composition of American Food Materials (E. S. R., 83, p. 699). Mineral values were generally obtained from several sources, including Sherman's Chemistry of Food and Nutrition (6th ed., 1941) and unpublished tables compiled by the U. S. D. A. Bureau of Human Nutrition and Home Economics from published and unpublished original data. Vitamin values were carefully chosen after a review of data, both published and unpublished, obtained from State agricultural experiment stations and Federal, commercial, and other laboratories. A preface to the table discusses problems in derivation of the averages, gives notes on the special foods or groups selected, and explains the terms employed. The nutritive values are expressed in terms of 100 gm. edible portion, and 1 lb. as purchased. Special Army ration items and canned products are included, as well as the characteristic foods most commonly used in the United States.

The specific heat of foodstuffs, I, II (*Tex. Univ. Pub. 4432 (1944), pp. 39, illus. 11*).—This study is carried on in two parts.

I. *An experimental determination of the specific heats of foodstuffs*, B. E. Short (pp. 5-26).—A presentation of the results of experimental work on the determination of specific heats and the freezing region of six sugar solutions (5, 10, 15, 20, 30, and 50 percent concentration by weight) and the following listed foodstuffs: Lima beans, carrots, Swiss chard, black-eyed peas, green (English) peas, tomatoes, apples, figs, grapes, oranges, Elberta peaches, strawberries, beef, ham, shrimp, sea trout, eggs, and ice cream. A temperature range generally, of -30° to $+70^{\circ}$ F. was used in the determination, and specific heat values were measured at approximately 10° intervals in these limits. The experimental values of the specific heats of these substances are used to determine the heat that would be added in raising the temperature from

—40° to a particular temperature above this point at intervals of 10° up to 80°. All experimental results are presented in both tabular and graphic form to show trends, with the freezing region and initial freezing point of each material clearly marked.

II. *A mathematical and thermodynamic determination*, L. H. Bartlett (pp. 27-39).—A mathematical thermodynamic development of formulae for arriving at the thermal capacity value of certain materials which in turn can be integrated between selected temperature ranges to determine heat removed in this temperature range. Certain assumptions in the formulae determinations were necessarily made by the author. As a check on the validity of those assumptions a comparison of calculated results with experimental calorimetric data obtained for two foods showed a surprising agreement in results indicating that all assumptions made were justified.

The chemistry of growth and the food value of the common eel (*Anguilla anguilla* (L.)), R. A. McCANCE (*Biochem. Jour.*, 38 (1944), No. 5, pp. 474-480, illus. 1).—"Data have been presented: (1) For the composition of elvers after some weeks in fresh water, and of yellow and silver eels of various sizes, (2) for the weight and composition of eel organs, and (3) for the food value of eels and for their losses on cooking.

"On a percentage basis, elvers contain less protein, fat, Na and K salts, and more water than older eels, and they must have a lower osmotic pressure. They are rich in iron and magnesium. The next few years are characterized by an increase in the percentage of protein, Na and K and Ca salts. The percentages of water, iron, and magnesium fall. In the later years of growth and in the preparation for migration, fat is gradually deposited, particularly in the muscles, with a corresponding fall in the percentage of protein, water, Na and K salts. The fall in Ca is greater than can be accounted for in this way. The liver of a silver eel may contain over 100 mg. of iron per 100 gm. wet weight. There may be over 25 percent of protein in the skin.

"The above, and other chemical changes of growth, have been correlated with events taking place in the body and with similar and dissimilar changes in the chemistry and growth of the higher vertebrates. One hundred grams of the flesh of a silver eel would provide 15 gm. of 'first-class' protein, and 300 calories. From the point of view of food, elvers must be regarded as a good source of Ca, P, and Fe."

Studies of the composition of the wheat kernel, I-II. (U. S. D. A. coop. Ohio Expt. Sta.). (*Cereal Chem.*, 22 (1945), No. 5, pp. 351-371, illus. 3).—

I. *Distribution of ash and protein in center sections*, V. H. Morris, T. L. Alexander, and E. D. Pascoe (pp. 351-361).—A detailed and illustrated description is presented of a new microdissection technic applicable to the study of various parts of the wheat grain. A hard red winter wheat (Tenmarq) and a soft red winter wheat (Trumbull) were examined for ash and protein content after being separated into four pure endosperm and two bran fractions. Composite samples were used, representing several crops grown at a number of different localities.

"The lowest concentration of ash was found in the 'cheek endosperm' fraction of both varieties, with the 'center' endosperm fractions about 0.05 percent higher. The concentration of ash in the peripheral endosperm zone was considerably greater than in the cheek or center fractions, although the magnitude of the difference was not the same for both varieties. Concentrations ranged from 0.246 to 0.400 percent in endosperm fractions of the Tenmarq samples and from 0.206 to 0.564 percent in Trumbull fractions. The ash content of the total endosperm of the center section was 0.359 and 0.417 percent for Tenmarq and Trumbull, respectively. In the bran fractions, Tenmarq was 0.86 percentage points higher than Trumbull, 6.42 compared to 5.56 percent. The pattern of distribution of protein in the various

fractions was much the same as for ash except that the lower concentration was found in the center endosperm, with the cheek fraction somewhat higher. The increase from the endosperm to the bran was much less. The protein content of the peripheral endosperm zone was 13.6 and 10.9 for Tenmarq and Trumbull, respectively, as compared with 8.9 and 6.8 percent in the center zone.

"The rate of increase in concentration of ash and protein in the peripheral zone as compared to the central zone was about the same for both constituents. The principal point of difference in distribution was in respect to the bran coat. In these tissues the protein content was about 1.4 times that of the whole endosperm, in contrast to the ash content which was 13 to 18 times that of the endosperm. The relatively wide difference in concentration of ash and protein in the two zones into which the endosperm was separated offers considerable support to the idea of an increasing gradient in the concentration of these constituents from the center of the endosperm to the bran coat."

II. *Distribution of certain inorganic elements in center sections*, V. H. Morris, E. D. Pascoe, and T. L. Alexander (pp. 361-371).—Samples of ash, obtained from the wheat fractions by the dissection method described above, were used in the present analyses. Assays were made of the major mineral elements—phosphorus, potassium, sodium, calcium, and magnesium; and three minor elements—manganese, iron, and copper. A description is given of the spectrographic procedure used to determine quantitative values with relatively small amounts of ash (0.5 to 5.0 mg.).

Results showed that "on an ash basis, potassium was higher in concentration in the peripheral than in the central zone; phosphorus and calcium about the same in the two zones; sodium, manganese, and copper were lower in the peripheral zone. The trends of magnesium and iron were uncertain because of inconsistent results. Comparing concentrations in the endosperm as a whole ('total endosperm') with those in the bran coat, magnesium and manganese were higher in bran ash, and phosphorus and potassium were about the same in the two tissues; sodium, calcium, iron, and copper were higher in the endosperm."

"On a dry-matter basis, the peripheral zone contained higher concentrations of phosphorus, potassium, calcium, and probably magnesium than did the central zone. Results with the remaining elements were inconsistent. The relatively higher ash content of bran as compared with endosperm is reflected by the fact that concentrations of all the elements were higher in the former. Of the relatively large differences in total ash shown to exist between the central- and peripheral-endosperm zones, the two major ash constituents—phosphorus and potassium—account for a considerable part of the higher ash in the latter zone. The composition of the bran resembled that of endosperm in that both phosphorus and potassium were major constituents. It differed, however, in that magnesium also was a major constituent, the concentration equaling about half that of potassium."

Questions and answers on enriched corn meal, flour, bread, and grits (*South Carolina Sta. Misc. Pub., rev. 1944, pp. [6]*).—This revision of an earlier edition (E. S. R., 92, p. 291) brings up to date the information on States having legislation requiring enrichment of flour and bread. Eighteen States, Hawaii, Newfoundland, and Puerto Rico now have such legislation, while Alabama, Georgia, Mississippi, North Carolina, and South Carolina also require the enrichment of grits and degerminated corn meal.

Cakes made with honey at high altitudes, E. J. THIESSEN. (Wyo. Expt. Sta.). (*Amer. Bee Jour.*, 85 (1945), No. 8, pp. 278-279, illus. 3).—Five types of cake recipes are given which include baking adjustments with honey.

Potato mealiness determined by specific gravity, O. SMITH. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, pp. 13-14).—The specific gravity of potatoes, as indicated by their tendency to sink or

float in brine solutions, was found to be associated with the mealy quality in tests over a 6-yr. period involving some 150,000 tubers. For the practical purpose of differentiating between soggy and mealy potatoes, two solutions are recommended. Potatoes that float in a brine of specific gravity 1.078 (22 oz. common salt in 11½ pt. water) are definitely not mealy. Those that sink at 1.078 but float at 1.088 (24½ oz. salt in 11 pt. water) are slightly to medium mealy, while those that sink at sp. gr. 1.088 are mealy.

Why moisture in peanuts should be controlled, J. G. WOODRUFF. (Ga. Expt. Sta.). (*Food Indus.*, 17 (1945), No. 11, pp. 90-92, illus. 5).—Essentially noted elsewhere (E. S. R., 94, p. 8).

Electronics in the service of food technology, J. C. MOYER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, pp. 1-2, 3, illus. 2; also in *Canner*, 101 (1945), No. 24, pp. 14-15).—This brief report of work in progress on the blanching of vegetables by electronic heating points to some of the technical problems of operation, including the problem of arcing between electrodes with resultant burning of the vegetable, the problem of heat loss, and the problem of interfering electric fields. These difficulties were eliminated, respectively, by the use of an oscillator capable of delivering 750 w. of electrical energy at a frequency of 150 million cycles per second, by the mounting of the electrodes in an air oven at 100° C., and by the use of loops of cooper ribbon to short circuit the electrodes. Experimental blanching of washed, prepared samples of fruits and vegetables, packed in cartons with cellophane liners and placed between the electrodes, showed that this method heated the product throughout at the same time and permitted blanching of cabbage, for example, with only a 3-percent loss of its ascorbic acid as compared with a 30- to 40-percent loss upon comparable blanching in steam or hot water.

Chemical and nutritional studies of canned vegetable soybeans, A. KRAMER, C. H. MAHONEY, E. STEPHENSON, and A. L. MARKS (*Maryland Sta. Bul.* A39 (1945), pp. 67-86+, illus. 2).—Following the increased use of soybeans as a canned green vegetable, this study was made to determine their nutritive value and to investigate possibilities of better processing. Thirty-three literature references are cited. Samples of soybeans canned in 1941, 1942, 1943, and 1944 were analyzed in 1944. There were no outstanding differences between varieties, although Emperor showed somewhat higher protein, calcium, and iron and low carbohydrate values, while Giant Green showed slightly lower protein and higher carbohydrate content. Long storage brought about a loss of the major portion of thiamine and reduced the carotene content, but storage for as long as 3 yr. had little effect on the mineral content. Five methods of preparation were used for studying the four stages of maturity (preoptimum, optimum, postoptimum, and mature): An 8-min. blanch and a 3-percent brine; a 15-min. blanch and a 3-percent brine; an 8-min. blanch, a 3-percent brine, and calcium sulfate; an 8-min. blanch and a 2-percent sugar solution; and an 8-min. blanch, slack fill, and a 3-percent brine. Beans of the optimum stage of maturity contained the highest quality of protein, fat, ascorbic acid, and carotene. Beyond the optimum stage, increased maturity decreased the protein, fat, calcium, phosphorus, and iron content; the ascorbic acid was completely lost in the dry stage of maturity; thiamine remained fairly constant. The carbohydrate content increased with maturity from less than 4 percent at the preoptimum stage to 11 percent at the dry stage. An increase in blanching time brought about a gradual decrease in all the proximate constituents except fiber, phosphorus, ascorbic acid, and thiamine. Processing treatments indicated that the higher temperatures for a shorter length of time (250° F. for 25 min.; blanching temperature 205°) resulted in higher moisture, ash, and thiamine and lower protein, carbohydrate, and phosphorus contents. Soybeans' tendency to gel after processing were investigated and found to vary with the

stage of maturity and variety. Analysis of the gel-forming substance showed it to be a gum. Proper can filling and blanching and shorter storage periods tended to decrease the tendency to gel.

Preservation of red mango pepper hulls, F. W. FABIAN and L. H. HONTZ. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 7, pp. 198-199).—Three methods are given of preserving sweet red pepper hulls which may be used in making pickle relish and garnishing packaged pickle products. The Early California Wonder and World Beater varieties were mixed and separated into three different lots. The peppers were divided longitudinally, and the seeds and stems were removed before weighing. In the method which proved most satisfactory, the pepper hulls were covered with a 70° salometer brine (18.5 percent) and 15 lb. of salt per 100 lb. of peppers was added. Practically no fermentation appeared in the peppers; they had excellent color and were firm in texture, with few soft spots appearing in them. Other observations on the keeping quality of preserved peppers indicated that partially matured hulls did not spoil as rapidly as the fully ripened peppers, and that maintenance of a 70° brine was necessary to insure against spoilage.

The fermentation of pickles, C. S. PEDERSON. (N. Y. State Expt. Sta.). (*Form Res. [New York State and Cornell Stas.]* 11 (1945), No. 4, pp. 6, 12).—It is pointed out that salt is important in controlling the type of fermentation, and that pickles packed in weak brines (< 2 percent) must be kept covered to control undesirable scum formation due to development of surface yeast growth. Pickles packed in 2-percent brine require no refreshing before finishing, those in brines up to 5 percent require one change of water, while those in strong brines (15 percent) need as many as four changes of water in refreshing. A method devised to reduce the sugar needed for pickling reutilized the partly spent liquor from sweet pickles for the second pickling brine of pickles originally packed in salt and vinegar with a minimum amount of sugar.

Syrups from grapes and raisins, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), No. 1, pp. 19-21; also essentially noted in *Wines and Vines*, 26 (1945), No. 9, pp. 19, 38-39).—The procedures for preparing industrial sirups from raisins, white grapes, and apples are outlined. Grape sirup, after storing, has a tendency to develop dextrose sugar crystals and ferments if yeast enters it; these tendencies may be prevented if the concentration does not exceed 66° Balling and if the sirup is heated in its container to 175° F., or flash pasteurized to about 180°, then filled into cans, sealed hot, and quickly cooled to below 110°. It is observed that the presence of SO₂ prevents darkening of the sirups in storage. Suggested uses are given for all three types of sirup.

Cold-mix dehydrated fruit spreads, G. L. BAKER, V. E. POLLARI, and W. G. MURRAY. (Del. Expt. Sta. et al.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 12, pp. 356-360, illus. 2).—Sugars, hydrocolloid thickening agents, salts, and acids were added to a dehydrated fruit base which formed a cold mix upon the addition of the proper amount of water. Studies showed that thickening the jam to the right consistency for spreads depended upon the pectic grade of the fruit powders or the thickening agents used. Several types of agents were analyzed for their relative thickening actions. Carrageen (Irish moss) extractives were found to be excellent thickening agents, but did not possess the anticaking properties of low-methoxyl pectins. Further experimentation indicated that improvement on the thickening action of low-methoxyl pectin was necessary. This was accomplished by "film-drying" the pectin (method described) and adding the required amount of a product known as V-90 (monocalcium acid phosphate) as a source of calcium ions, which are necessary for the gelation of this pectin. Sweetening agents aided resistance to caking and served as diluents for the mix. Common salt and citric acid proved aids in flavor; sodium citrate served as a buffer against the action of the

acids naturally present in the dehydrated fruits. The best fruits for the cold-mix jam products from the standpoint of flavor were apples, apricots, cranberries, pineapples, raspberries, and tomatoes. The addition of synthetic flavor and coloring to the base improved the taste and appearance of the jam.

Powdered gel or dessert bases, V. E. POLLARI, W. G. MURRAY, and G. L. BAKER. (Del. Expt. Sta. et al.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), No. 1, pp. 6-8, illus. 1).—In an effort to develop a dehydrated gel dessert readily handled in transportation and storage, research was directed toward preparation of a basic recipe for a dessert mixture which could be combined with synthetic flavor, dehydrated fruit powders or fruit particles, and color. For preparation of a gel dessert, water was added to the complete mixture, followed by heating to aid solution, and cooling for gelation. The basic gel was made with a low-methoxyl pectin, a metallic ion (an anhydrous monocalcium phosphate proved most satisfactory), acid, and buffer salt, plus various combinations of dextrose and sucrose based on the relative volume occupied by the base and the type of pectin used (45 percent soluble solids recommended). In using dehydrated fruit powders and particles, slight variations, practical for industrial application, were made in the recipes, depending on the variety of fruit and the pectin.

Stability of ascorbic acid in powdered mixes and in low-solids gels, W. G. MURRAY, V. E. POLLARI, and G. L. BAKER. (Del. Expt. Sta. et al.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), No. 2, pp. 36-37, illus. 1).—To ascertain the retention of l-ascorbic acid in the basic gel powders described above and in the gels made from them, determinations were made using the dye titration method. Low solids gels (45 percent soluble solids), containing 50 mg. of ascorbic acid per 42 gm. finished gel, were packed in sealed jelly glasses and stored for 19 days at temperatures varying from 25° to 50° C. Ascorbic acid determinations made at irregular intervals showed that gels stored at 40° and 50° progressively lost ascorbic acid, two-thirds of the initial ascorbic acid being lost at the end of the 19 days; those stored at 30° lost 46 percent. Powdered mixtures, controls for the gels, which were placed in cellophane bags and stored at the same temperatures, showed greater ascorbic acid retention than the gels themselves. Additional powdered mixtures were placed in amber stoppered bottles and stored at the same temperatures for 70 days. Assays made at irregular intervals indicated stability of ascorbic acid at all temperatures below 50°. A slight charring was noticed at this temperature. The gel powders were next placed in glass jars and stored at each of the experimental temperatures for 45 days. Samples made into gels and assayed after 24 hr. at 26° showed approximately 90 percent retention of the ascorbic acid at all temperatures; again, powders stored at 50° showed a slight charring. "It is concluded that properly packaged gel powders may serve as carriers for vitamin C in the Army diet."

Compressed dehydrated vegetable blocks: The application of high frequency heating, E. RUSHTON, E. C. STANLEY, and A. W. SCOTT (*Chem. and Indus. [weekly]*, No. 35 (1945), pp. 274-276).—This investigation deals with the problem of compressing dehydrated potatoes and cabbage, usually in the form of small shreds or strips and packed loose in tins, into blocks 3 in. square by 1 in. thick for the purpose of economy in packing materials and shipping space. Potatoes are not yet compressed into blocks as a routine production operation as are carrots and cabbage. Cabbage and potatoes may be made into a compact block, with a moisture content of 9 and 15 percent, respectively, which does not break excessively under compression; but to insure satisfactory storage life, the moisture contents of the blocks must be reduced by further drying to 5 percent for cabbage and 7 percent for potatoes. Usual methods are effected in a cross-air-flow tunnel dryer, with block temperatures below 60° C., for 6-8 hr. "These long drying times are due to the low rate at which the moisture diffuses from the interior of the blocks, and it had been recognized that this process could be accelerated by using high-frequency heating methods."

Two methods are outlined for reducing drying time. One is drying at atmospheric pressure, in which some reduction is achieved by means of high frequency heating in the open air, taking from 1½ to 2 hr. for drying cabbage blocks from 9 percent down to 4 percent moisture, and requiring from 3 to 4 hr. to dry potato blocks from 16 percent down to 6 percent. "The application of the method to large-scale drying would present considerable practical difficulties since, owing to the inevitable slight variations in moisture content, careful regulation of the high-frequency power supply is needed if heat damage to the blocks is to be avoided."

The other method, drying at reduced pressure, was carried out by the vacuum method, which gave a more uniform temperature in individual blocks than did heating at atmospheric pressure, although it is possible, as before, to overheat and damage the material. The temperatures of the blocks could be safely raised to 60° in about 15 min. The vacuum methods should not be difficult to apply to cabbage, but would be for potato due to its greater susceptibility to heat damage. "The difference between the time for drying to a given moisture content by the open air and vacuum methods is not so marked for cabbage, although a saving in time of up to 50 percent can be achieved."

Suitability for dehydration of nineteen varieties of lima beans, J. S. CALDWELL, C. W. CULPEPPER, M. C. HUTCHINS, B. D. EZELL, and M. S. WILCOX. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), No. 2, pp. 39-46, 59).—A study was made of the drying behavior and quality of 19 varieties and strains (10 of the bush type and 9 climbing, or pole, varieties) of lima beans. The beans were divided into 4 groups and various screen sizes. Six varieties were rated superior in color, flavor, and texture: Burpee Best; Early Leviathan; Ideal, or Mammoth; Improved Challenger; King of the Garden; and the unnamed selection 403A. All of these, except the last, are pole varieties. A second group was made up of varieties in which the smaller sizes were excellent in quality but which declined in flavor and color in the larger sizes: Carpenteria and Giant Podded (pole varieties); and Early Market, Fordhook, and Fordhook 242 (bush varieties). A third group rated fair: Dreer Improved (a pole variety); and Cangreen, Clark, Henderson, Supergreen, and Woodruff (bush varieties). Two varieties, Sieva, a pole variety, and Jackson Wonder, a bush variety, were poor in appearance and flavor.

To justify the increased cost and lower yields of dehydrated beans, a number of varieties were allowed to air-dry on the vines. This material, when compared to dehydrated processed beans, was found markedly inferior in palatability and flavor. Ascorbic acid and carotene progressively decreased with the increasing size of the beans. Ascorbic acid losses in blanching in all varieties was approximately 50 percent of the amount present in the raw beans; the loss was furthered by dehydration, and after 8 mo. storage in air at 75° F., only traces remained.

A note on syrup processed dried fruits, W. V. CRUESS (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), No. 2, p. 38).—Through experimentation, it was found that figs and prunes are excellent products for salads, desserts, or breakfast dishes when they are cooked a short time in a medium sirup, allowed to stand for a brief period, drained, packed, and given a short process. Although apricots and peaches do not plump out well by this method, they are made very palatable.

Dehydration of cherries and small fruits, E. H. WIEGAND, E. M. LITWILLER, and M. B. HATCH. (Oreg. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), No. 1, pp. 9-14, 23, illus. 7).—In dehydrating cherries, strawberries, loganberries, red raspberries, and boysenberries, a number of pretreatments were used to study their effects on the retention of color and vitamin C content, and on conditions of the fruits held in storage under extremes of temperature and moisture (accomplished by subjecting to a tropical chamber). Experiments indicated that steam blanching resulted in better retention of SO₂, but that considerable amounts of SO₂

were lost upon exposure to a temperature of 95° F. for a long period of time. Re-sulfuring tests, though incomplete, showed that satisfactory concentration could be obtained by heating cherries, subjecting them to vacuum, releasing this with gas, and holding for a few minutes. It was observed that the higher the amounts of vitamin C retained in dehydrated strawberries, the greater the SO₂ retention; however, cherries and berries showed color darkening whether sulfured or unsulfured. The use of a thermoplastic wax coating for packages appeared effective in preventing moisture absorption in high-humidity storage. High temperatures resulted in some deterioration of the eating qualities of these fruits, but in most cases did not render the products unfit for pies, fruit cakes, jams, or preserves.

Reconversion of the locker industry, S. BULL. (Univ. Ill.). (*Quick Frozen Foods*, 8 (1945), No. 2, pp. 95, 107, illus. 1).—This article deals with the future of the frozen food locker v. the home freezer. Advice is given to owners of commercial lockers in regard to selling home freezers and commercial, frozen foods and for providing better service for locker patrons.

Using the home freezer, N. K. MASTERMAN. (Cornell Univ.). (*Quick Frozen Foods*, 7 (1945), No. 12, pp. 92-93, illus. 2; 8 (1945), Nos. 1, pp. 94-95, illus. 1; 2, pp. 98-99).—In a study of home freezing and storage equipment conducted in 1942-43, names of freezing equipment owners were obtained from manufacturers of home freezers, New York State extension workers, and public utility personnel. Questionnaires from 98 households showed that 55 percent of the freezing equipment owners were from farms; 15 percent from villages; 15 percent from suburbs; and 15 percent from city homes. Circulating air freezers were common on farms and cost from \$400 to \$495, while still air freezers costing from \$200 up to \$395 were most common among urban users. Operation costs based on 18-cu.-ft. freezers were found to be approximately 5 ct. per day. Most users expressed a desire for a freezer which would provide a 4.8-cu.-ft. capacity per person. In estimating the capacity needed for storing an adequate food supply for farm families, it was found that 178 lb. of fruits, vegetables, and meats would be in the freezer at one time. With planned and efficient use, 5 cu. ft. per person probably would be ample space for storing this amount. Lists of the kinds and sources of food stored by farm and urban families are given, and uses made of home freezers are noted.

Processing and storage of frozen foods, B. LOWE. (Iowa State Col.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 5, pp. 277-278).—In view of the increased demand for frozen foods in postwar years, this article deals with factors affecting the quality of frozen meats, poultry, and vegetables. Freezing usually increases the tenderness of beef and chicken, although beef varies somewhat with different muscles and the length of time it has been aged before freezing. The juiciness and flavor of frozen chicken decrease progressively after 9 days and up to 79 days of test storage. The amount of deterioration in frozen vegetables varies with storage temperatures and length of time the packs are held. The ideal storage period and temperature depends on the food but, in general, foods may be held 3 to 8 mo. with little loss of quality.

Nutritive value of frozen foods, D. K. TRESSLER (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 5, pp. 273-276).—This review summarizes the material covered in 32 literature references on the retention of common nutrients found in a large variety of commercially frozen foods. The actual freezing process does not appreciably affect the carotenoid, provitamin A, and ascorbic acid content of fruits and vegetables. During preparation for freezing, however, thiamine losses may be as great as 25 percent and ascorbic acid losses may amount to 20-40 percent. While thiamine and carotene (except for asparagus and lima beans) are not lost during storage, ascorbic acid losses may be considerable above 0° F. The survey indicates that relatively little has been done to determine the carbohydrate, protein, mineral, and fat content of frozen foods; however, these are not notably affected by freezing and storage.

Blanching experiments on frozen corn-on-the-cob, D. E. BULLIS and E. H. WIGAND. (Oreg. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 12, pp. 361-367, 377, illus. 7).—The experimental work reported here was directed toward finding the cause for defective flavors commonly found in frozen corn on the cob. The corn for the experimental packs was selected for uniformity of ear size and maturity. After holding at 34°-36° F. overnight, the ears were cut into 5½-in. lengths. Holes of ⅜ to ½ in. were drilled lengthwise in one-half of the cobs, which measured 1½ in. in diameter. Duplicate lots of six each of the drilled and solid ears were variously blanched, including water blanching at 190° and 212° and steam blanching at 212° and 240°, each with and without addition of salt or adjustment of the acidity in the blanching or cooling water. Tests for catalase and peroxidase in kernel and cob tissue showed that peroxidase was less readily inactivated than catalase, and that the former was less readily inactivated in cob tissue than in kernel tissue. At 190°, the time required to sufficiently inactivate the enzymes in the center of the cob resulted in overcooking of the corn. The addition of salt or adjustment of pH did not reduce the time for satisfactory blanching but did tend to toughen or to affect the natural flavor of the product. The ears with the hole drilled longitudinally through the cob allowed ready access of the blanching water or steam to the center of the ear and permitted enzyme inactivation in at least 2 min. less time than was required for the solid ears. Results of enzyme tests indicated that the adequacy of blanching should be determined by a benzidine test on the cob tissue rather than on the kernel tissue, which is inactivated in a shorter time. A brief resumé of 13 literature references dealing with findings on the general application and freezing of corn is given.

A note on frozen apple juice, W. V. CRUESS and A. J. GLAZEWSKI. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), No. 1, pp. 5, 27).—Apple juice, made by the conventional method of pressing and crushing, lost fresh apple flavor, while that prepared by a commercial method using vacuumizing and flash pasteurizing possessed a rich, fresh flavor and white color. Both types of juice deteriorated noticeably in 3 to 6 mo. after storage at 80°-85° F., but in frozen storage they retained the qualities of fresh apple juice. Of the three methods of fermentation used in making sharp cider from four varieties of apples, wine yeast in the presence of SO₂ yielded a product that was yeasty and undesirable in flavor; natural fermentation produced an off-flavor; and fermentation with pure wine yeast was found very satisfactory. It is suggested that the label on commercially frozen apple juice advise mixing the contents thoroughly after thawing.

Freezing fruit juices proved practical, W. V. CRUESS, L. A. HOHL, and A. J. GLAZEWSKI. (Univ. Calif.). (*Quick Frozen Foods*, 8 (1945), Nos. 1, pp. 60-61, 80, illus. 3; 2, pp. 58, 111-113, illus. 1).—The experimental work done on frozen fruit juices since 1920 is reviewed here. In view of the observed demand for these products, experimental work was carried out on frozen apple juice (see above), orange and apricot puree mixtures, plum juices, orange juice, grapefruit juice, prune juice and prune juice blends, tomato juice and blends, punch sirups, sour cherry, apple and apricot, and fruit nectars.

Freezing Muscadine grapes, J. G. WOODROOF and I. S. ATKINSON. (Ga. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), No. 2, p. 52).—Due to the highly perishable tendencies of Muscadine grapes, only the juice has been used commercially. A general method is outlined here for utilizing the entire grape by deseeding, removing excess tartness of the skins, tenderizing, packing with sugar, and freezing. This method provides a wide application in the home and in the commercial field.

The food supply of rural families in the six mile area of Pickens County, 1939-40 and 1942-43, A. M. MOSER (*South Carolina Sta. Bul.* 360 (1945), pp.

45).—In 1940, 136 rural white families of Pickens County, S. C., were interviewed to obtain information relative to their food supply. The farm households studied included 55 owner operators, 47 tenant operators, and 22 share croppers; 12 nonfarm households were also studied. Annual per capita incomes for these respective farm groups, estimated at farm prices in 1939–40, were approximately \$60, \$49, and \$40. Farm families produced almost all of their food supply except sugars; the nonfarm families produced more than 50 percent of all their foods except sugars, fats other than butter, cereal products, dried legumes, and nuts. Food production programs were superior among farm owners; the other groups moved too frequently to afford opportunity for well-planned production. On the basis of the recommended quantities of food for annual per capita consumption reported in a previous study (E. S. R., 88, p. 548), farm families' diets were rated more adequate than the other group. Approximately 15 percent of all families studied were thought to have satisfactory food supplies throughout the year; 30 percent appeared to have definitely inadequate supplies. The average amounts of money spent for food were not very different among the families having good, fair, and poor food supplies. Although actual estimates of the nutritive values of yearly diets were not made, it was noted that ascorbic acid and niacin were the nutrients usually found to be inadequate. It was apparent from the dietary ratings that, of the groups who had the largest farm business, (on the basis of a previous study) (E. S. R., 87, p. 287), only one-third had food supplies that were satisfactory nutritionally. In some cases, where labor incomes were low or lacking, it was evident that the production of food for the family was efficiently managed. However, labor incomes were not always correlated with the food supply as it measured only the profit obtained from the farm as a business and did not consider the living the family obtained from the farm. In the spring of 1943, a second visit was made to 128 of these families to determine what changes in the food supply a wartime year had brought. Trends were shown toward increased production of livestock, garden vegetables, wheat, and canned food. Recommendations and methods for improving the diets of rural families are noted.

Average food consumption in the training camps of the United States Army (1941–1943), P. E. HOWE and G. H. BERRYMAN (*Amer. Jour. Physiol.*, 144 (1945), No. 4, pp. 588–594).—This report gives results of surveys of Field Ration A consumption in 455 Army messes during 1941–43. Each mess was studied over a period of 6–10 days and the results were reported as a 30-day average of the individual surveys. Tables are given showing the average quantities of various food groups, the average number of calories, and the amounts of other nutrients consumed per man per day. The caloric value of the foods consumed by different types of units (infantry, artillery, etc.) in a specified number of messes is shown in table form. The average caloric intake of the average soldier per day was approximately 3,700, with a minimum of 3,132 calories for induction center groups and a maximum of 4,135 calories for demolition units. At 3,960 calories, the intake was highest in the fall of the year, dropping in the spring to 3,570 calories and rising to 3,790 calories in the summer. The edible waste as determined in 455 messes averaged 0.39 lb. per man per day. Data tabulated to show the quantities of food prepared in comparison to food consumed indicated that about half of the edible waste was table waste and other half kitchen waste. The information obtained on this phase of the study suggested that the length of time used in the average army mess preparation, cooking, and serving of food may be excessive. The food consumption levels reported point out that the American soldier in the training camps of this country receives an adequate diet, although messing operations may be of such nature that the optimum amount is not received.

Nutritive value and cost distribution of food of Army students, D. T. ODLE and M. M. KRAMER. (Kans. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 5, pp. 285-286).—The nutritive value of the food consumed by 1,095 Army students was studied for a 2-week period. It was found that the specified servings of food and dietary requirements recommended by the National Research Council were adequately supplied. Four groups of foods accounted for over 90 percent of the raw food cost in the following proportions: Meat, fish, poultry, and eggs, 42 percent; milk and milk products, 23 percent; vegetables and fruits, 16 percent; and grains and grain products, 10 percent. It was estimated that the food cost averaged \$0.632 per man per day.

Studies on growth and blood formation in guinea pigs, M. D. CANNON, G. J. MANNERING, M. ZEPPLIN, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Arch. Biochem.*, 7 (1945), No. 1, pp. 55-68).—The experiments of Mannering et al. (E. S. R., 92, p. 300) have been extended to study the effects of various food supplements and of sulfonamides on growth and blood formation in guinea pigs fed a standard basal ration.

Young guinea pigs weighing 150-200 gm. averaged gains of 7-8 gm. per day from the second to eighth week of life when fed a stock diet containing alfalfa leaf meal, wheat, oats, and soybean oil meal. Their blood averaged 5,00 leucocytes per cubic millimeter and 14 gm. of hemoglobin per 100 cc. In comparable animals fed a basal ration of sucrose, casein, salts, corn oil, supplementary vitamins, and 25 percent linseed oil meal, only 19 out of 51 survived the full 6 weeks' experimental period and averaged weight gains of approximately 3 gm. daily. Their leucocyte count averaged 2,600 per cubic millimeter, and blood hemoglobin averaged 11 gm. per 100 cc. Addition of "folic acid" concentrate to this basal diet proved deleterious. Supplements of 4 percent solubilized liver, 16 percent liver powder, whole liver substance or alfalfa leaf meal, or 8 percent grass juice powder, brewers' yeast, or corn steep powder, while producing various favorable effects on both growth rate and blood formation, were unable to equal the results obtained with the stock diet.

The addition of succinylsulfathiazole to the stock diet produced little if any changes from the normal results. With the already deficient basal diet containing linseed oil meal the added sulfonamide caused reduced growth and produced severe anemia and leucopenia in the single animal which survived 3 weeks. Addition of 4 percent solubilized liver to this diet produced a slight increase in survival time. Addition of the other substances mentioned above only partially counteracted the adverse effect of the succinylsulfathiazole, as both growth rate and blood picture remained inferior to the comparable control animals.

Measurement of the growth-promoting quality of dietary protein, R. H. BARNES, J. E. MAACK, M. J. KNIGHTS, and G. O. BURR. (Univ. Minn. et al.). (*Cereal Chem.*, 22 (1945), No. 4, pp. 273-286, illus. 4).—A comprehensive series of tests was made in an effort to determine the most satisfactory method of assaying the growth promoting quality of proteins. Various standard accepted procedures were compared to see whether (1) the measurement of body weight gain was an accurate index of body protein gain, (2) the level of protein in the diet produced any variation in the relative values, and (3) pair-feeding experiments were advisable.

A basal diet containing sucrose and adequate in all other constituents except protein was fed to weaned albino male rats. The protein content of the various foods studied (whole wheat, white rice, wheat gluten, soya flour, and spray-dried whole egg) was calculated by using the factor $N \times 6.25$. The results, presented graphically and tabulated, indicated that paired-feeding tests could give an artificially low value for good quality protein when compared with protein of inferior quality, whereas changes to ad libitum feeding could increase the protein efficiency value considerably. Further tests were made, using paired-feeding at a 10-percent protein level, and ad libitum feeding at seven different protein levels.

In general, growth rates increased with increased protein levels until a maximum was reached, which corresponded to a different optimum percentage of protein with each food studied. However, it was noted that the maximum nutritive value of each protein could be approximated when the rate of protein intake was adjusted so that roughly 0.9 gm. of protein was retained by the test animal. Protein efficiency, if calculated from the results of ad libitum feeding at a 10-percent level, tended to penalize the poorer proteins, while corresponding pair-feeding gave relatively better values to the low-quality proteins. The authors conclude from their tests that the maximal utilization of absorbed protein for the synthesis of body protein was theoretically the most valid expression of the growth-promoting quality of dietary protein. In measuring the nutritive value of protein for growth, the establishment of the maximal ratio of body weight gained to protein consumed was considered to be the most useful of the methods studied, which do not involve fecal and carcass nitrogen analyses.

The nutritive quality of some plant proteins and the supplemental effect of some protein concentrates on patent flour and whole wheat, E. L. HOVE, L. E. CARPENTER, and C. G. HARREL (*Cereal Chem.*, 22 (1945), No. 4, pp. 287-295, illus. 2).—A study was made of the nutritive value of some wheat products and the supplemental value of certain high-quality plant proteins when added in varying proportions to the protein of patent flour and whole wheat. Protein quality was determined by the rat-growth technic involving ad libitum feeding of the test proteins at a 10-percent level based on the conversion factor of $N \times 6.25$. Values for protein efficiency ranged from 0.84 for patent flour to 2.86 for wheat germ. Other high-quality protein values found were nonfat dry milk solids 2.84, corn oil meal 2.56, shorts 2.45, wheat bran 2.15, and soybean oil meal 2.14

"Patent flour was supplemented with various protein concentrates. Nonfat dry milk solids and wheat germ were about equal in their ability to improve the nutritive quality of patent flour. Six percent nonfat dry milk solids added to white flour resulted in a protein efficiency value only slightly lower than the value for whole wheat. Whole wheat was supplemented with various protein concentrates. Soybean oil meal and whole wheat showed mutual supplementation in that mixtures possessed better nutritive quality than either component alone."

The amino acids yielded by various yeasts after hydrolysis of the fat-free material. A comparative investigation, R. J. BLOCK (*Arch. Biochem.*, 7 (1945), No. 2, pp. 313-321).—Using accepted chemical and microbiological methods, the authors have analyzed the amino acids in eight commercially available yeasts grown under different conditions and two extracts prepared from autolyzates.

Each of the amino acids studied—arginine, histidine, lysine, tyrosine, tryptophan, cystine, methionine, threonine, leucine, isoleucine, and valine—was assayed simultaneously or consecutively in all 10 samples by the same analyst, in an effort to obtain highly comparable conditions.

"The results indicate that the amino acid content of *Saccharomyces cerevisiae* is quite constant, though it may vary somewhat, depending upon the variety and the nutritive medium. Yeasts are especially valuable food supplements in diets where cereal grains furnish all or almost all of the dietary protein."

The dietary rôle of histidine in the immature and adult rat, A. A. ALBANESE and J. E. FRANKSTON (*Bul. Johns Hopkins Hosp.*, 77 (1945), No. 1, pp. 61-67, illus. 3).—Experimental diets containing basic amounts of sucrose, starch, agar, Crisco, cod-liver oil substitute, and a salt mixture were used. Brewers' yeast (3.6 percent) was added as the source of the B-complex vitamins. The protein fraction was supplied as follows: (1), a mixture of 19 crystalline amino acids, excluding l(+)-histidine; (2), same as (1) with the addition of 0.88 percent histidine; and (3) Amigen.

Although the diets containing the crystalline amino acids apparently were lacking in some essential substance, as the rats fed these diets only grew about half as fast as the controls fed Amigen, the need for histidine in the diet was clearly demonstrated. Lack of histidine produced loss of weight and decreased the food intake, while addition of histidine restored the normal trend observed on the control amino acid diet. The authors conclude that "by the use of amino acid mixtures it has been shown that histidine is a dietary essential for growth of young rats and for weight maintenance in the adult rat."

Thiourea (thiocarbamide): Adult life span feeding experiments with rats, A. HARTZELL (*Contrib. Boyce Thompson Inst.*, 13 (1945), No. 10, pp. 501-513, illus. 4).—Previously reported experiments (E. S. R., 90, p. 560) have been continued on the same series of rats for a period up to 3 yr. Results are substantially in agreement with the author's earlier findings. No abnormalities or pathological changes attributable to the prolonged feeding with thiourea could be found.

The role of dietary fat and linoleic acid in the lactation of the rat, J. K. LOOSLI, J. F. LINGENFELTER, J. W. THOMAS, and L. A. MAYNARD. (Cornell Univ.). (*Jour. Nutr.*, 28 (1944), No. 2, pp. 81-88).—"Studies are reported in which the growth of standardized litters to 17 days of age is used as a measure of lactation performance. In these studies rats suckled by mothers fed a diet containing corn oil made more rapid growth than rats whose mothers were fed a fat-free diet. Carcass analyses showed that the extra gain of the young consisted largely of fat.

"A diet containing hydrogenated coconut oil gave no better growth than the fat-free diet. No improvement in growth of the young was produced by feeding ethyl linolate to the mothers or directly to the young. Similarly, feeding the mothers 125 mg. of ethyl linolate each day did not improve the lactation response on the fat-free diet."

Choline and the prevention of hemorrhagic kidneys in the rat.—III, Amounts of water, nitrogen, total lipid, and choline in livers and kidneys, J. M. PATTERSON and E. W. MCHENRY (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 265-269).—"In a 10-day experimental period, during which a deprivation of choline causes kidney abnormalities in young rats, there is a reduction in the actual amount of phospholipid in the kidneys and livers as well as a decrease in the ratio of phospholipid to total lipid. There is also a decrease in the amount of choline, although the ratio of choline to total phospholipid is practically unchanged." The authors conclude that these results support the hypothesis that the kidney damage is due to a decreased formation of phospholipid.

Cholesterol injury in the guinea pig, R. OKEY. (Univ. Calif.). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 179-190, illus. 2).—Young guinea pigs were kept on an adequate basal diet, supplemented with 1 percent cholesterol for a given period with subsequent return to the basal diet for a recovery period. Results showed that one of the first reactions to cholesterol feeding was fatty livers with a high cholesterol ester content. Gallstones were frequently found in those animals whose basal diet contained supplements of dried grass and riboflavin. After cholesterol feeding had been discontinued, the deposits of cholesterol esters built up in the liver required 4 to 6 mo. for removal.

Other pathological changes found included anemia (caused by rapid red blood cell destruction), high reticulocyte counts, and splenic hyperplasia. Concurrently an increase in free cholesterol occurred in the liver, blood stream, and various tissues, while a decreased ratio of lecithin to cholesterol in these tissues was observed. A discussion is given as to the possible function of phagocytic cells in cholesterol metabolism or in the removal of cholesterol esters from the liver.

Studies on the interrelation of fats, carbohydrates, and B-vitamins in rat nutrition, R. K. BOUTWELL, R. P. GEYER, C. A. ELVEHJEM, and E. B. HART.

(Wis. Expt. Sta.). (*Arch. Biochem.*, 7 (1945), No. 1, pp. 143-157).—Previous reports by Deuel et al. (E. S. R., 92, pp. 857, 858), Geyer et al. (E. S. R., 91, p. 215), and Boutwell et al. (E. S. R., 89, p. 758; 92, p. 577) on the effects of various fats upon the growth rate of rats fed purified diets have been somewhat contradictory.

The present study has attempted to interpret, if possible, the disparity in the conclusions of the previous investigators. The authors conclude from the results of this experiment, in which butterfat and corn oil are compared, that "a change in the kind of dietary fat altered the apparent requirement of the rat for vitamins of the B-complex when sucrose, a fructose-glucose mixture, starch, dextrin, dextrin-maltose, or lactose was the carbohydrate in certain rations.

"On any of the above carbohydrates, rats which received butterfat and a medium level of thiamine, riboflavin, pyridoxin, pantothenic acid, and choline grew at a faster rate than comparable rats fed corn oil. This inferiority of corn oil could be reduced on lactose rations and eliminated on all other rations by raising the level of these vitamins and adding high levels of inositol, *p*-aminobenzoic acid, and nicotinic acid plus 1 percent of whole liver powder. No difference in growth between the rats receiving butterfat and those fed corn oil was obtained at any vitamin level when glucose or a galactose-glucose mixture was the carbohydrate portion of the ration. Rats receiving either of the two fats on the lactose ration grew less than animals fed similar rations containing other carbohydrates, but this inferiority decreased as the level of the water-soluble vitamins was increased. The galactose per se was not responsible for this retarded growth."

The urinary elimination of nicotinamide methochloride by man, P. ELLINGER and R. A. COULSON (*Biochem. Jour.*, 38 (1944), No. 3, pp. 265-270, *illus.* 5).—The effect of the intake of nicotinamide and several related compounds on the elimination of the methylated derivative was studied. Employing the technic of Coulson et al. (E. S. R., 92, p. 470), an attempt was made to determine the state of saturation in man with respect to nicotinamide. Nicotinamide, nicotinic acid, nikethamide, and nicotinic acid-mono-ethyl-amide increased the methochloride output, while trigonelline, pyridoxine, nicotino-nitrile, thiamine, or riboflavin produced no such effect. The authors summarize their experiments as follows: "The total daily urinary elimination of nicotinamide methochloride by man was determined and found to vary individually and in the same person at different times within the range of 2 and 8 mg. in 24 hr. Ingested nicotinamide increases the elimination of nicotinamide methochloride. The study of the elimination suggests the occurrence of storage and saturation of nicotinamide. . . . The effect of a number of factors (food, alcohol, work) influencing the elimination of nicotinamide methochloride was studied. The height of the nicotinamide methochloride elimination is determined by the intake of nicotinamide and related compounds and their use by the body and the presence of methyl-donators and the efficiency of the methylating mechanism."

On the assumption that the normal daily elimination of methochloride is 7.5 mg. and that 15 percent of the ingested nicotinamide is eliminated as this derivative, the authors infer that this would indicate the presence of more than 40 mg. niacin in the food ingested daily. The suggestion is made that an extra dietary source of niacin, nicotinamide, or the methochloride derivative produced by bacterial action or biochemical synthesis in the human body is responsible.

Biological function of minor elements, O. BAUDISCH (*Soil Sci.*, 60 (1945), No. 2, pp. 173-184, *illus.* 10).—The function of minor elements in enzyme systems, particularly as these operate in respiration and biological synthesis, is discussed. Toward determining why nature uses trace metals in cooperation with proteins and how the protein is attached to the metal, the author has made use of magnetism as a tool. The experimental work cited points to the significance of magnetochemistry and of the protein component in the enzymatic system.

The deposition of calcium, phosphorus, and carbon dioxide in calcifying enamel. M. DEAKINS and R. L. BURT (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 77-83, illus. 2).—Dental enamel was used in the study of calcification because of three attributes: (1) It is histologically homogeneous; (2) it calcifies en masse; (3) calcifying enamel undergoes neither simultaneous resorption nor growth of the matrix. Pig enamel was obtained from 20 or more teeth at or before eruption and at all stages from the softest to the hardest enamel at various levels of calcification. The results indicate that as enamel hardens the increase in ash is fivefold, but the ash : Ca : P : CO₂ contents increase linearly and in constant ratio to each other throughout the range of calcification. The authors conclude that "these elements are deposited as a complex compound having a fixed composition. Their atomic ratios do not fit the formula for hydroxyapatite or carbonate apatite."

A technic for using the Warburg apparatus to determine CO₂ in 5 to 10 mg. samples of tissue is described.

A syndrome of dietary origin in the pregnant rat resembling toxemia of pregnancy. W. E. ARMSTRONG and P. P. SWANSON. (Iowa Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 19 (1943), No. 11, pp. 756-761, illus. 4).—Autoclaved pork muscle, dried to one-half its original weight, was added to a basal diet in amounts needed to provide 15 percent protein (25 percent of the diet). The other constituents of the diet included cornstarch, 53 gm.; yeast, 5 gm.; agar-agar, 2 gm.; NaCl, 1 gm.; Osborne and Mendel salt mixture, 4 gm.; butterfat, 8 gm.; and cod-liver oil, 2 gm.

In 30 percent of the pregnant female rats fed this diet, toxic symptoms occurred characterized by cyanosis, convulsions, and death shortly before parturition. Comparable control animals fed a stock ration (modified Steenbock diet) were never found to exhibit these symptoms. A discussion of the possible explanations for the toxic condition is given.

The microbiological assay of vitamins: The estimate and its precision. D. J. FINNEY (*Quart. Jour. Pharm. and Pharmacol.*, 18 (1945), No. 2, pp. 77-82, illus. 1).—The nicotinic acid content of a meat extract solution was assayed using *Lactobacillus arabinosus* as the test organism. A detailed statistical analysis of the data led to the conclusion that the growth response "appears to show a linear relationship with the dose rather than with the logarithm of the dose." A discussion of the relative precisions of the usual standard reference curve v. the statistical treatment recommended is given.

The effect of storage upon the vitamin content of dehydrated fruits and vegetables. M. B. PATTON and D. COMIN (*Ohio Sta. Bimo. Bul.* 235 (1945), pp. 148-151).—Peas, sweet corn, wax beans, peaches, and plums were dehydrated and stored for several months at room temperature in sealed and unsealed glass jars and pliofilm bags. Assays of carotene, thiamine, and ascorbic acid were made on the original dehydrated samples. Only carotene and thiamine determinations were run on the stored products. The amount of ascorbic acid found in the dehydrated foods was considered to be too low to warrant further assay.

Losses of carotene, after 6 months' storage, varied from 2.2 percent in peas to 67.8 percent in peaches, averaging about 50 percent in corn and beans and 37 percent in plums. Thiamine losses averaged from 10 to 13 percent in the three vegetables. Peas retained 6.2 µg. thiamine per gram of dehydrated product and beans retained 5.6 µg./gm.

In general no consistent correlation was observed between the method of packaging and sealing and the loss of vitamins during storage.

Vitamin A in butter (*U. S. Dept. Agr., Misc. Pub.* 571 (1945), pp. 14-).—The findings here presented are those obtained in a Nation-wide cooperative project participated in by the U. S. D. A. Bureau of Dairy Industry and 20 State agricultural experiment stations in the butter-producing areas of the United States. The

methods for obtaining the samples of butter and determining its carotene and vitamin A content were those developed by a technical committee appointed to formulate methods. The vitamin A content of the butter was determined by using the antimony trichloride method, a modification of the one by Koehn and Sherman (E. S. R., 83, p. 729), taking into account the color given by other materials in the butter which react with this reagent and applying a conversion factor to cover the 7-percent loss generally observed in recovery trials. The carotene content was determined by washing the carotene solution in Skellysolve B with either 92 percent methyl alcohol or 94 percent diacetone alcohol to separate the carotene from the other pigments in the butter and then reading the carotene fraction either colorimetrically or spectrophotometrically. In calculating total vitamin A potency of butter, 0.6 µg. of carotene and 0.25 µg. of vitamin A were each considered as equal to 1 International Unit of Vitamin A. Analyses were made of a total of approximately 3,500 samples, collected at weekly or monthly intervals from representative creameries in production areas of 14 States in 3 regions.

The data showed that the vitamin A potency of butter produced under winter feeding conditions averaged about 11,200 I. U. per pound, whereas summer butter averaged approximately 18,000 I. U. A weighted average, based on these figures in conjunction with the proportion of winter and summer butters marketed, indicated that the average vitamin A potency of the total output of creamery butter in the United States is approximately 15,000 I. U. per pound. Storage studies, conducted by 7 of the States, showed that commercial storage and handling has negligible effect on the vitamin A potency of the butter. The vitamin A potency of butter sold on retail markets in representative areas in 4 States was found to be essentially the same as the average vitamin A potency of the creamery butter produced in this country.

Vitamin A potency of Ohio butter, W. E. KRAUSS, L. SKINNER, J. W. HIBBS, T. V. ARMSTRONG, and W. L. SLATTER (*Ohio Sta. Bimo. Bul.* 236 (1945), pp. 157-163, illus. 2).—The tests were conducted as part of the national cooperative butter project. Butter samples obtained at bimonthly or monthly intervals over a period of 2 yr. from 11 creameries scattered throughout Ohio were analyzed for carotene and vitamin A, and from these values their vitamin A potency was calculated. The same samples were re-analyzed for carotene and vitamin A after they had been in commercial butter storage at 0° F. for 6 mo. and 12 mo.

"The average vitamin A potency of these butters showed considerable seasonal variation—from a low of 8,800 International Units per pound in March 1943 to a high of between 16,500 and 17,000 International Units per pound in May and September of 1944. The average vitamin A potency for summer-produced butter (May through November) was 15,500 and for winter-produced butter (December through April) was 10,400 International Units per pound. The mean annual potency, weighted for production, was a little less than 14,000 International Units per pound. . . .

"It was found that butter loses little of its original vitamin A potency while in storage at 0° for as long as 12 mo.

"Butter produced in northwestern Ohio was higher in vitamin A potency during the drier months of the pasture season, while that produced in southeastern Ohio reached a high peak in potency earlier in the spring. These variations are presumed to be related to the kind of pastures predominating in those areas and to seasonal differences."

Butter tested for vitamin A, B. L. HERRINGTON. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 11 (1945), No. 4, pp. 1, 6).—This brief report of a study conducted as part of the national cooperative butter project (noted above) presents the results on the vitamin A potency of butter sold on the retail markets of Syracuse, N. Y. A total of 372 samples, representing 62 different

brands, was purchased over a period of a year, from April 1943 to May 1944, in stores in seven representative areas in Syracuse. In some low-income areas, the stores were small and the refrigeration facilities poor, while in other areas the stores were large and the butter was given excellent care. The samples were all analyzed at the station by the methods formulated by the technical committee of the national project. The average values calculated by months ranged from 9,300 International Units per pound in April to 20,900 in August; the average of the monthly averages was 15,180 I. U. No real difference was found in the vitamin A content of the butter sold in different parts of the city. In each area, some of the butter was very high in vitamin A content and some was very low; flavor scores also indicated that each part of the city received about the same mixture of good and poor lots of butter.

Re-investigation of the relative provitamin A potencies of cryptoxanthin and β -carotene. H. J. DEUEL, JR., E. R. MESERVE, C. H. JOHNSTON, A. POLGÁR, and L. ZECHMEISTER (*Arch. Biochem.*, 7 (1945), No. 3, pp. 447-450, illus. 1).—The present study continues the series of experiments previously described in detail (E. S. R., 93, p. 803) dealing with the relative provitamin A potencies of β -carotene and other carotene derivatives. In two independent series of bioassays, in which 135 rats were used, the ratios of β -carotene to cryptoxanthin were found to be 100 : 54 and 100 : 59. The average potency of cryptoxanthin was thus calculated to be 57 percent of that of β -carotene.

The biological value of carotene from various sources and the effect of vitamin E on the utilization of carotene and of vitamin A. K. GUGGENHEIM (*Biochem. Jour.*, 38 (1944), No. 3, pp. 260-264).—The liver storage test for vitamin A (noted on page 427) was used to study the utilization of vitamin A and of carotene obtained from different sources, and to assess these two forms in terms of biological values. The author concludes that "the biological value of vitamin A contained in medical preparations and beef liver approaches 100; that of carotene in various plant materials ranges between 33 and 67, except in lettuce, in which it was found to be nearly 100. The poor utilization of most of the plant carotenes is not caused by a large percentage of the less active or altogether inactive carotenoid pigments in these materials, or to a high carotene excretion with the feces. The utilization of carotene from various plant sources, or of carotene dissolved in different oils, varies according to the vitamin E content of these materials. Vitamin E increases both the utilization of vitamin A and of carotene, and the fecal excretion of carotene. Apparently it acts by protecting carotene and vitamin A against oxidation in the intestine, as a result of which their resorption and excretion are increased. It is concluded that the human vitamin A requirement depends to a great extent on the vitamin E content of the food."

The distribution and comparative content of certain B-complex vitamins in pork muscular tissues. E. E. RICE, M. E. DALY, J. F. BEUK, and H. E. ROBINSON (*Arch. Biochem.*, 7 (1945), No. 1, pp. 239-246).—The determination of the thiamine, riboflavin, niacin, and pantothenic acid contents of 24 muscles from the ham, shoulder, flank, and loin regions of four animals was made. Results indicated that the vitamin content of the various muscles in a single animal could vary as much as 200 to 300 percent. Although the absolute amount of the vitamins varied from animal to animal, the same muscles in each animal tended to possess the same relative vitamin content.

Muscles containing relatively large amounts of thiamine usually contained similarly high levels of niacin but relatively low levels of riboflavin and pantothenic acid.

The theoretical and practical implications of the data are discussed, and the need of carefully paired samples in the study of cooking losses as well as the use of relatively large samples for vitamin analysis is emphasized.

The riboflavin and vitamin B₆ potency of tissues from rats fed succinyl sulfathiazole with and without liver supplements. B. S. SCHWEIGERT, L. J. TEPLY, I. T. GREENHUT, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 144 (1945), No. 1, pp. 74-78).—Rats were fed a basal ration containing 67 percent of dextrin and supplemented with thiamine, pyridoxine, nicotinic acid, riboflavin, calcium pantothenate, choline, inositol, biotin, and halibut-liver oil. Those receiving succinyl sulfathiazole with this diet grew at a much slower rate than rats without the drug. The riboflavin content of the livers and muscle tissues was not affected by the ingestion of the drug, but when 2 or 6 percent solubilized liver was added to the diet, the riboflavin values were greater than those observed when 300 µg. of riboflavin per 100 gm. of diet was fed.

The B₆ potency of rat livers was determined by the technic of Tepley and Elvehjem (E. S. R., 94, p. 295), using *Streptococcus lactis* and *Lactobacillus casei*. The rats fed succinyl sulfathiazole gave liver values markedly lower in B₆ potency than those fed the basal diet (0.28-0.29 v. 0.62-0.70 µg. per gram fresh liver). The inclusion of 2 or 6 percent solubilized liver in the diet increased the B₆ potency fivefold to ninefold.

The nutritive value of canned foods.—X, Further studies on riboflavin, niacin, and pantothenic acid. M. IVES, M. ZEPFLIN, S. R. AMES, F. M. STRONG, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 6, pp. 357-359, illus. 1).—These results on the 1943 pack of 36 different commercially canned foods are compared with the values obtained in the previous studies of Ives et al. and Thompson et al. (E. S. R., 94, p. 396). The microbiological methods of Snell and Strong (E. S. R., 82, p. 587) for riboflavin and Krehl et al. (E. S. R., 90, p. 727) for nicotinic acid were used. The authors describe their own modification of Neal and Strong's method (E. S. R., 90, p. 728) for pantothenic acid. In general, there was good agreement of ranges between the 1943 and the 1942 pack. The variation in vitamin content from year to year was no greater than the variation to be expected from samples of the same product from different localities, canned during the same growing season.

Intestinal synthesis of B vitamins by the rat. B. S. SCHWEIGERT, J. M. MCINTIRE, L. M. HENDERSON, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Arch. Biochem.*, 6 (1945), No. 3, pp. 403-410, illus. 1).—The authors have attempted to correlate the technics used and extend the findings obtained by Morgan et al. (E. S. R., 79, p. 566) and Mannering et al. (E. S. R., 93, p. 372). Studies were made on the effect of cecectomy on the growth of young rats fed high sucrose (73 percent) synthetic diets containing limited amounts of B vitamins; the effect of cecectomy and sulfasuxidine feeding together with modifications in the kind of carbohydrate on the total thiamine and riboflavin excretion; and the effect of subminimal vitamin levels on growth and thiamine and riboflavin excretion.

Results showed that cecectomy of young rats produced little if any difference in growth rate when compared to control rats fed the same diet. Adult rats fed a high carbohydrate diet containing lactose, sucrose, or dextrin showed greatest riboflavin synthesis on the lactose diet. Cecectomy and/or the feeding of sulfasuxidine markedly reduced the synthesis of riboflavin on the lactose diet. Similar reduction in synthesis was found when dextrin was used, although the initial level of riboflavin excretion was much lower than when lactose was fed.

The levels of riboflavin excretion remained fairly constant on the high sucrose diet under the above conditions (cecectomy, and/or sulfasuxidine feeding, or normal diet).

On all three diets, thiamine excretion was found to approximate only about 25 percent of the thiamine intake.

Rats preliminarily fed a high sucrose diet containing suboptimal amounts of B vitamins, when shifted to a high lactose diet, showed an increase in growth and a corresponding rise in thiamine and riboflavin excretion. Removal of the riboflavin from this lactose diet produced loss of weight and a subsequent reduction in thiamine and riboflavin excretion.

In normal rats, on a high lactose diet, an intake of 210 $\mu\text{g.}$ or 56 $\mu\text{g.}$ per week of riboflavin produced approximately the same level of riboflavin excretion (about 450 $\mu\text{g.}$).

Experimental studies on man with a restricted intake of the B vitamins. A. KEYS, A. HENSCHER, H. L. TAYLOR, O. MICKELSEN, and J. BROZEK. (Univ. Minn. et al.). (*Amer. Jour. Physiol.*, 144 (1945), No. 1, pp. 5-42, illus. 6).—Previous experiments by Keys et al. (*E. S. R.*, 93, p. 228) have been elaborated and modified in order to increase the rigidity of control and the sensitivity and completeness of the test methods. The present experiments are described in detail and discussed under two main headings: I, The borderline of deficiency (pp. 5-19); and II, the results of acute deprivation of vitamins of the B complex (pp. 19-40). Fifty references are included.

In the first phase of the study, eight presumably healthy young men were tested over a 161-day period. A restricted natural diet, low in B vitamins, was provided. Meat, fish, vegetables, fruit, fats, bread, jelly, and sweets were so fed as to provide approximately 3,300 Calories and 75 gm. of protein daily, with fat comprising about 35 percent of the total calories. This diet furnished about 0.185 mg. thiamine, 0.87 mg. riboflavin, and 3.71 mg. niacin per 1,000 Calories. Half the subjects (group I) received placebos and the other four men (group II) received daily supplements containing 1 mg. thiamine, 1 mg. riboflavin, and 10 mg. niacinamide. Results of a comprehensive and detailed series of biochemical, physical, and psychological tests showed little difference between the two groups.

"The 24-hr. urinary excretion of thiamine became substantially constant in less than a month in both restricted and supplemented groups. For the last 3 weeks of the experiment it averaged 7 $\mu\text{g.}$ (1.1 percent of the intake) and 114 $\mu\text{g.}$ (8.5 percent of the intake) in the two groups, respectively. The 24-hr. urinary excretion of riboflavin became substantially constant in about 2 mo. in the restricted group. In the supplemented group there was no tendency toward any progressive alteration from the beginning. For the last 3 weeks of the experiment the daily excretion of riboflavin in the urine averaged 137 $\mu\text{g.}$ (12.1 percent of the intake) and 438 $\mu\text{g.}$ (22.5 percent of the intake) in the two groups, respectively. . . . The resting level of pyruvic acid in the subjects on the low vitamin intake increased from an average of 1.01 mg. per 100 cc. of blood at the start of the experiment to 1.15 mg. at the end, and this change was statistically significant. There was a slight tendency toward a similar difference in the two groups after brief exhausting exercise. No differential change in blood pyruvate occurred following the ingestion of glucose."

There were no signs of deleterious effects from the restriction in riboflavin and niacin.

In the second phase of the study, the results of 33 days of acute deprivation of B vitamins were observed on the same eight men. The subjects were regrouped so that two of the men previously fed the supplemented diet were paired with two previously fed the restricted diet and acted as positive controls. The remaining four men served as the deficient group. The basal diet used was composed primarily of cornstarch, dextrose, sucrose, casein, butter, shortening, and salt. Baking powder, spices, coffee, chocolate, and hard candy rendered the combined other ingredients more palatable. Adequate amounts of minerals, ascorbic acid, and vitamins A and D were provided by capsules ingested daily. This basic diet provided 0.008 mg. thiamine, 0.013 mg. riboflavin, and 0.1 mg. niacin per 1,000 Calories. In addition

the control groups received capsules containing 1 mg. thiamine, 1 mg. riboflavin, 10 mg. niacin, 25 mg. pyridoxine, plus 1.2 gm. dried yeast, while the deficient group received placebos. The results of this experiment were striking, and the authors have listed as follows the major functions or areas of performance in which deterioration appeared in the deficient men: First—gastrointestinal (anorexia and nausea); early—emotional (depression, etc.), psychomotor (coordination), "fitness" as estimated from willingness to continue severe work; late—metabolic (lactic and pyruvic acid), neurological (including peripheral sensation), cardiovascular (heart rate during and after exertion), endurance (moderate to fairly severe work); very late or resistant—strength, general body chemistry, liver function, special senses, intellectual functions, and riboflavin and F_2 excretion.

All evidence indicated that thiamine deficiency was the dominant factor, as marked improvement resulted from thiamine supplementation while continuing the same diet deficient in the other B vitamins. Thiamine deficiency symptoms appeared 5 to 6 days earlier in the two men on the deficient diet who had lived for 161 days prior to this experiment on the restricted diet (I). Excretion of thiamine became practically zero in all the "deficient" men. Riboflavin excretion also fell, but became stabilized after a week at levels considerably in excess of the intake. Personality changes occurred, and progressive deterioration in endurance, coordination, and fitness was noted in the "deficient" group. "The present results confirm the conclusion that the restricted diet described in part I of this paper was less than adequate or optimum, at least in thiamine, but that such inadequacy represented only a loss of a few days in the margin of safety. It is concluded that the quantitative objective methods for estimating function used in this laboratory are properly sensitive to vitamin deficiency and are suitable to characterize the effects of diet on fitness, performance-capacity, and the functional state. Serious limitations in both sensitivity and reliability of clinical methods in acute deficiency of the B vitamins were demonstrated."

Biotin deficiency in relation to reproduction and lactation, C. KENNEDY and L. S. PALMER. (Minn. Expt. Sta.). (*Arch. Biochem.*, 7 (1945), No. 1, pp. 9-13).—Rats fed a basal synthetic diet containing 30 percent powdered egg albumin as the sole source of protein, and supposedly adequate vitamin supplements with the exception of biotin and folic acid, were unable to rear their young to the weaning age. Supplementation with 2 μ g. to 6 μ g. of biotin daily did not noticeably affect the birth rate. When 15 percent casein replaced 15 percent of the egg albumin in the ration, and a biotin supplement was given, no improvement in reproduction or lactation was observed. Somewhat less evidence of biotin deficiency was found in the crossbred black rats used than in the albino rats.

Investigation showed a normal estrus cycle and normal stages of pregnancy up to the eleventh to thirteenth day, but the number of resorptions was very high. Lactation in all groups was very poor, as evidenced by early death of young, destruction of litters by the mother rat after several days of life, and very poor growth of the surviving young.

"Biotin is one of the factors needed for successful gestation and the birth of viable young in the rat and is probably a necessary factor in lactation; however, as folic acid was not included in the ration the effect of biotin on lactation is not positively shown."

Furan and tetrahydrofuran derivatives.—IV, The synthesis of hexahydro-2-oxo-1-furo[3,4]imidazole derivatives, K. HOFMANN (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 4, p. 694).—In a communication to the editor the author describes briefly the hydrogenation of several derivatives, one of which is represented to be an oxygen analog of biotin.

"O-heterobiotin," a biologically active oxygen analog of biotin, R. DUSCHINSKY, L. A. DOLAN, D. FLOWER, and S. H. RUBIN (*Arch. Biochem.*, 6 (1945), No. 3, pp. 480-481).—A synthetic analog of biotin, containing an atom of oxygen in place of sulfur in the formula, was tested as a growth factor for *Saccharomyces cerevisiae* No. 139 and *Lactobacillus casei*. This substance, called O-heterobiotin, exhibited 25 percent of the activity of *d*-biotin for both test organisms. The authors note that, other than *d*-biotin, this analog is the only substance reported to date having any significant growth-promoting activity for *L. casei*.

The biological activity of O-heterobiotin, S. H. RUBIN, D. FLOWER, F. ROSEN, and L. DREKTER (*Arch. Biochem.*, 8 (1945), No. 1, pp. 79-90, illus. 5).—In more comprehensive studies on the biologic activity of O-heterobiotin (see above), the authors have noted the following results: "The growth-promoting activity of racemic O-heterobiotin for five strains of *S.[accharomyces] cerevisiae* and for *L.[actobacillus] casei* is about 25 percent of the activity of *d*-biotin, and for *L. arabinosus* 50 percent of *d*-biotin. O-heterobiotin is inactivated by avidin in the same stoichiometric proportions as biotin. Desthiobiotin inhibits its growth effect for *L. casei*. Experiments on the utilization of O-heterobiotin by yeast indicate that the mechanism involves conversion to biotin or a vitamin of similar activity. The influence of various sources of sulfur on this conversion is reported. O-heterobiotin cures egg-white injury in the rat at an activity level of 5 percent of *d*-biotin."

The microbiological activity of an oxygen analog of biotin, F. J. PILGRIM, A. E. AXELROD, T. WINNICK, and K. HOFMANN (*Science*, 102 (1945), No. 2637, pp. 35-36).—The growth-stimulating effect of the oxygen analog of biotin synthesized by Hofmann (see above) was determined for three micro-organisms: *Lactobacillus arabinosus*, *L. casei*, and *Saccharomyces cerevisiae*. On a weight basis, the *dl*-oxygen analog, *dl*-oxybiotin, was one-half as active as natural *d*-biotin for *L. arabinosus*, while somewhat less active (40 percent) for *L. casei*. With the *Lactobacilli*, the shape of the growth curves are identical for the two biotin compounds. With *S. cerevisiae*, different activity ratios at different portions of the curve are obtained: At one-half maximum growth, the activity of *dl*-oxybiotin was 25 percent that of *d*-biotin, while at maximum growth it was only 8 percent as active.

The biological activity of oxybiotin for the rat and the chick, K. HOFMANN, R. H. MCCOY, J. R. FELTON, A. E. AXELROD, and F. J. PILGRIM (*Arch. Biochem.*, 7 (1945), No. 2, pp. 393-394).—A biotin deficient diet containing 10 percent egg white was fed to groups of weanling male rats. After biotin deficiency symptoms had appeared, varying amounts of *d*-biotin and *dl*-oxybiotin were fed to the different groups. Results showed that 2.0 µg. *dl*-oxybiotin produced approximately the same therapeutic effect as 0.1 µg. *d*-biotin.

Chicks were tested prophylactically with 10 or 20 µg. *d*-biotin and 20 or 40 µg. *dl*-oxybiotin supplements which were added to a purified basal diet low in biotin. The test groups were all free of biotin-deficiency symptoms in contrast to the negative control group. In a therapeutic test similar results were obtained. In both cases *dl*-oxybiotin was used in larger amounts and produced smaller weight gains.

The authors note that although it possesses a lower activity, oxybiotin is the first known compound having any activity comparable with that of biotin for higher animals.

Further studies of pyruvate metabolism by livers from vitamin B-deficient rats, F. J. PILGRIM and C. A. ELVEHJEM. (*Wis. Expt. Sta.*). (*Jour. Biol. Chem.*, 156 (1944), No. 1, pp. 257-264, illus. 1).—In addition to the effects of pantothenic acid and biotin deficiencies previously studied by Pilgrim et al. (*E. S. R.*, 88, p. 859), riboflavin and thiamine deficiencies were studied in their relation to pyruvate metabolism.

"Pyruvate oxidation by homogenates of liver from rats in various nutritional states was measured in the presence and the absence of magnesium ions in a phosphate buffer. The presence of magnesium caused a decreased QO_2 (pyruvate) in the livers from rats deficient in pantothenic acid or biotin, and in those fed sulfadiazine. In the case of riboflavin- and thiamine-deficient rats and normal rats fed restricted quantities of purified ration, the magnesium caused no significant inhibition. The results were variable when the rats were fed *p*-aminobenzoic acid, thiourea, or the basal ration ad libitum." The results suggest that biotin and pantothenic acid have some function, direct or indirect, in pyruvate metabolism. The variable findings indicate that the results are complicated by complex nutritional requirements and a complex enzyme system, neither of which is completely known at present.

Riboflavin content of canteen meals, M. KERLY (*Biochem. Jour.*, 38 (1944), No. 5, pp. 423-425, illus. 1).—The author's modification of the microbiological method of Snell and Strong (E. S. R., 82, p. 587) was used. Three food samples were checked by the rat-growth method, and the results were found to be in good agreement. A table is presented of the foods composing 17 meals taken from school canteens, restaurants, and one industrial canteen. Average servings of the meal were taken, air-dried at 70°-80° [C.], then mixed and ground.

A typical meal included meat, potato, cabbage, and pudding. Riboflavin values were found to range from 0.28 to 0.93 mg. per meal, with the higher values occurring in general when eggs, and/or cheese, bread pudding, and custard were served. Separate assay values are also listed for porridge (0.016 mg. per 100 gm. wet weight) and tea (8-16 μ g. per gram).

The distribution of thiamine and riboflavin in wheat grains, G. F. SOMERS, M. H. COOLIDGE, and K. C. HAMNER (U. S. D. A.). (*Cereal Chem.*, 22 (1945), No. 4, pp. 333-340, illus. 5).—The method of Somers and Coolidge (E. S. R., 93, p. 661) for locating thiamine and riboflavin in wheat kernels has been elaborated to allow photographic reproduction of the fluorescence produced.

Cut wheat grains treated with alkaline ferricyanide, and suitably illuminated produced characteristic fluorescence when viewed through the proper filter combination. Photographs of the fluorescence produced indicate that "the thiamine of the wheat grain is located principally in the aleurone layer, in the endosperm cells adjoining the aleurone cells at the base of the crease, in the scutellum of the embryo (including its epithelium), and in the endosperm adjoining the scutellum. These photographs indicate that all parts of the embryo contain approximately equal amounts of riboflavin. The embryo and the aleurone layer appear to be regions of the grain containing the greatest concentration of riboflavin, although the bran coats appear to contain some of this vitamin."

Effect of washing and cooking upon the thiamin content of brown and partially polished rice, C. D. MILLER (Hawaii Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 6, pp. 345-347).—Thiamine was assayed by the author's rat growth method (E. S. R., 90, p. 855). Different lots of short-grain California brown rice were used. All assays were run using cooked samples carefully weighed so that calculations could be made on a raw weight basis. The washed samples of brown and partially milled rice were washed in five changes of water. Brown rice samples were soaked 2 hr. in $1\frac{1}{4}$ vol. of hot water, then cooked in that water by boiling followed by steaming (cooking time 50 min.). The partially polished rice was not soaked before cooking (as above) in $1\frac{1}{3}$ vol. of water (cooking time 40 min.). The results showed that the thiamine content of the different lots varied considerably: 208 μ g. to 298 μ g. per 100 gm. calculated to a raw weight basis. During the washing of brown rice no appreciable loss of thiamine was apparent.

"Partially polished rice as sold in Hawaii contains about 70 percent as much thiamine as the unprocessed brown rice. Partially polished rice lost more thiamine

than brown rice as a result of washing (about 20 percent). This increased loss may largely be due to the washing off of adhering rice polish which clings to the partially polished grains."

Ways are discussed of presenting brown or partially polished rice to the eating public. Recommendations are given for improving the thiamine content of the rice eater's diet.

The thiamine content of pig blood, J. W. PENCE, R. C. MILLER, R. A. DUTCHER, and W. T. S. THORP. (Pa. Expt. Sta.). (*Jour. Biol. Chem.*, 158 (1945), No. 3, pp. 647-651, illus. 1).—The normal concentration of thiamine in the blood of pigs was found to be 17 γ and 21 γ per 100 cc. for semifasting and nonfasting pigs, respectively, these values being approximately twice as high as those reported for normal human subjects. A rise in the blood thiamine level to approximately 30 γ per 100 cc. of whole blood occurred within a week when pure crystalline thiamine was fed in daily amounts of 25 or 50 mg. The concentration of blood thiamine in the pig was directly related to the amount of thiamine in the diet and to the thiamine content of the muscle tissue.

The effect of maceration of foods upon their ascorbic acid values, M. C. SMITH and E. CALDWELL. (Ariz. Expt. Sta.). (*Science*, 101 (1945), No. 2621, pp. 308-309).—Apples, celery, cucumbers, green peppers, potatoes, radishes, and tomatoes were assayed. Uncut, chopped, or sliced samples and juices were compared. Potatoes were also assayed, both boiled and mashed.

Under the various conditions of sampling, holding, and preparation for consumption, a large portion of the ascorbic acid present was transformed into the dehydro form. The authors emphasize the necessity of estimating both the dehydro and reduced forms of ascorbic acid in calculating the total ascorbic acid content or losses in ascorbic acid content, particularly in nonacid foods.

Content of vitamin C (l-ascorbic acid) in arctic plants, K. RODAHL (*Bot. Soc. Edinb., Trans. and Proc.*, 34 (1943-44), pt. 1, pp. 205-210).—Employing a modification of the Tillmans dye titration or the Emmerie and Van Eekelen method (E. S. R., 76, p. 155), the author has estimated the vitamin C content of numerous arctic plants found in North-East Greenland. Over 20 different species (listed by their botanical names) were tested, and different parts of the plant were found to vary in their vitamin C content, the leaves averaging consistently higher than the rest. Seasonal variations in vitamin C content also occurred, the lowest values being found during the winter months.

The author concludes that, if the need arises, several native plants are sufficiently rich in ascorbic acid to serve as sources of this vitamin for man, and that no scurvy need occur even if the usual accepted sources of ascorbic acid are lacking.

Ascorbic acid content of some Florida-grown guavas, M. J. MUSTARD (*Florida Sta. Bul.* 414 (1945), pp. 12+, illus. 4).—"Ascorbic acid determinations were made upon representative fruits of various species, seedlings, and seedling races of guavas. All of these guavas were subject to similar environmental factors, since all of the fruits were collected from a single block of trees growing at the Sub-Tropical Experimental Station at Homestead, Fla. The ascorbic acid content of the skin, outer flesh, and central portion of one group of seedlings was determined. Statistical analyses of these data showed that significantly more ascorbic acid is found in the outer portions than in the inner portions of the fruit [skin 1,092.0 mg./100 gm., outer flesh 588.8 mg./100 gm., and inner flesh and seeds 405.1 mg./100 gm.].

"The analyses of guavas picked at different stages of maturity and not allowed to ripen before testing showed that small green and overripe fruits contain the most ascorbic acid, while large green and firm ripe fruits contain slightly less ascorbic acid [27 to 33.3 v. 18.7 to 24.7 mg./100 gm. in the Redland variety].

"The majority of the guavas classified as *Psidium guajava* L. were found to contain considerably more ascorbic acid than did those of the other species of guava tested [23.1 to 486 mg./100 gm., with an average of 156.6 v. 27.3 to 40.5 mg./100 gm. for five other varieties tested].

"No correlation between flesh color and ascorbic acid content was apparent among the fruit tested."

Vitamin C metabolism in potatoes, G. JULÉN (*Lantbr. Högsk. Ann. [Uppsala]*, 12 (1944), pp. 131-165, illus. 2; *Swed. abs.*, pp. 161-162).—Results previously reported (E. S. R., 93, p. 377) have been confirmed. Tests were carried out on potatoes sprouted in a dark cellar and in the light at room temperature. During sprouting, the ascorbic acid content of the portion between the eyes decreased, as did that of the whole tuber, whereas the decline in the eyes was very slight. The author considers that "this suggests a transport of ascorbic acid to the growing points from the other parts of the tuber in connection with germination. Whether sprouting took place in light or in darkness was of little consequence. Treatment of the tubers with ascorbic acid resulted in a more rapid sprouting and a more vigorous growth of the sprouts. The transport of ascorbic acid to the growing points and the stimulated development following a supply of ascorbic acid suggest that in potatoes vitamin C acts as a growth hormone. . . . No increase in the total quantity of vitamin C in tuber and sprouts has been observed, and consequently, there does not seem to be any new formation of vitamin C but merely a transport from the tuber to the sprouts. The function of the vitamin C as a germination and growth hormone in plants was discussed on the basis of data available in the literature and of the results obtained in the experiments carried out at the Institute of Plant Husbandry."

Fifty-three references, many of German or Scandinavian origin, are cited.

Epsom salts and nutrient value of berries, W. L. POWERS. (Oreg. State Col.). (*Science*, 101 (1945), No. 2621, p. 301).—Certain Oregon soils, deficient in magnesium, have been found to respond profitably to applications of magnesium sulfate. Gooseberries grown on such silty clay loam produced a maximum yield in relation to other treatments and showed improved cane growth and appearance of foliage.

"The vitamin C content of boysenberries from a plot treated with 40 lb. an acre of magnesium sulfate was found to be 24.4 percent above that of berries from an untreated check plot. This was 2.1 mg. more per 100 gm. than the fruits of any of nine other plots. Raspberries had 4 percent more vitamin C when grown on a plot treated with magnesium sulfate."

The vitamin K content of the California avocado, S. LASSEN, K. BACON, and J. SUTHERLAND (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 11, pp. 761-762, illus. 1).—The vitamin K content of the California avocado (Fuerte variety) was determined by the tentative A. O. A. C. method of Almquist (E. S. R., 86, p. 153). A vitamin K activity, expressed as 2-methyl-1, 4-naphthoquinone, of 8 µg. per 100 gm. avocado (edible portion) was found.

TEXTILES AND CLOTHING

The effect of foreign matter on the grade, staple, and price of cotton, M. A. GRIMES (*Texas Sta. Prog. Rpt.* 954 (1945), pp. 5; *Rayon Textile Mo.*, 26 (1945), No. 10, pp. 79-81).—The grade, staple, waste, and price were determined before and after cleaning for each of 60 cottons grown 1941-44 at the station and at Lubbock. The data suggested that either efforts should be made to develop suitable commercial-size equipment to clean lint cotton at the gin or the percentage of waste by weight should be determined and duly considered when the cotton is sold. The quantity of cotton within a bale would then be known, there would be fewer

bales with resultant savings on transportation, and the producer would sell and the mill buy a product of higher quality. These changes would necessitate adjustments in the present grading and pricing system.

Trash in cotton affects grade and price, M. A. GRIMES. (Tex. Expt. Sta.). (*Textile World*, 95 (1945), No. 11, pp. 133, 135, 224, 226, 229).—Noted above.

Distensibility and bursting strength of cotton hose of various constructions, M. S. FURRY and A. M. HANSEN. U. S. D. A.). (*Rayon Textile Mo.*, 26 (1945), No. 4, pp. 71-74, illus. 4).—The authors have summarized this article as follows:

"In this study stockings were knit in six different constructions from five commercial yarns: Two long-staple, combed American-Egyptian yarns of yarn numbers 60/1 and 120/2; two medium-staple, combed Peeler yarns of 40/1 and 80/2; and one short-staple, carded yarn of 40/1.

"Distensibility tests on the stockings showed that as the number of courses per inch in the fabric increased, additional force was required to distend the stockings. As regards combed yarns, hose knit from the 80/2 yarn required the greatest force to distend them. Those from the 40/1 yarn required somewhat less. Next in decreasing order were the hose from the 120/2 yarn. Hose knit from the 60/1 yarn required the least force of all. Stockings knit from the 40/1 carded and from the 40/1 combed yarns were much alike.

"Bursting strength tests showed that stockings made from the ply combed yarns are more resistant to popping than those from the corresponding single combed yarns. Also the heavier 40/1 and 80/2 yarns produced a stronger fabric than did the lighter 60/1 and 120/2 yarns. Stockings knit from the 40/1 carded yarn were much weaker than those knit from any of the combed yarns.

"The behavior of these stockings was also estimated by 18 women who judged the stockings for 'tightness,' 'fit,' 'appearance,' and 'preference.' The estimate of tightness correlated well with the results of laboratory tests. Hose knit from the finer ply yarn into constructions that fit the leg tightly were the most acceptable to these women."

The effect of wringing upon the tensile strength of rayon fabrics, D. S. LYLE and D. C. BLACK. (Pa. State Col.). (*Amer. Dyestuff Rptr.*, 33 (1944), No. 22, pp. 441-444, 455-457, illus. 36).—Five representative types of rayon fabrics were given 2 series of 50 hand washing treatments. The fabrics received a gentle squeezing and a hand wringing treatment to remove water. Results showed that the breaking strengths of the four woven and the one knitted fabric were closely similar when either method was employed. It was suggested that the dry and wet strengths should be taken into consideration in any washing instructions; nevertheless, the results in this study indicated that it is not always necessary to include instructions to squeeze gently to remove water in laundering.

Cleaners' Association on "good old home remedies" (*Rayon Textile Mo.*, 26 (1945), No. 4, p. 74).—A number of home methods of cleaning fabrics which involve dangers to guard against have been collected by the National Association of Dyers and Cleaners. They suggest that some spotting can be done at home, but housewives should avoid cleaning woollens with glue; cleaning necklines with coffee; employing sweet or sour milk to remove ink spots; removing grass stains by rubbing with lard or molasses; removing rust with cream of tartar and salt mixture; removing odors from clothes by laying them away with charcoal; or removing candle grease by applying a hot iron to blotting paper placed over the spot.

HOME MANAGEMENT AND EQUIPMENT

Farm housing in southern Oklahoma, R. T. McMILLAN (*Oklahoma Sta. Bul.* 290 (1945), pp. 23, illus. 1).—This study describes the housing of families living in areas representative of southeastern and southwestern Oklahoma. In southeastern

Oklahoma, where 371 dwelling units were surveyed, 49.6 percent of the homes were owner-occupied; 55.7 percent were less than 25 yr. old, while 28.1 percent were less than 10 yr. old; \$189 was the average replacement value; dwellings contained 3.9 rooms on an average; 28.6 percent were painted; 10 percent had solid wall foundations; 80.1 percent had shingled roofs and 29.6 percent leaky roofs; 77.3 percent of the dwellings were located less than 100 ft. from farm buildings and pens; 3.5 percent had kitchen sinks; and 2.4 percent had telephones. Of the 323 homes studied in southwestern Oklahoma, 50.8 percent were occupied by owners; 42.2 percent were less than 25 yr. old while 9.0 percent were less than 10 yr. old; replacement value averaged \$574; the average dwelling contained 4.4 rooms; 70 percent of the houses were painted; 50 percent had solid wall foundations; 97 percent had shingled roofs and 25.7 percent leaky roofs; 32.8 percent were located less than 100 ft. from farm buildings and pens; 33.4 percent had kitchen sinks; and 25.3 percent had telephones. Ceiled dwellings predominated in the southwestern area, while unceiled dwellings were preponderant in the southeastern area. The use of soft pine floors and wallpaper decorations were common to both sections. In the southeastern area, however, over one-fifth of the houses surveyed either had heavy builder's paper on the living room walls or no inside covering at all. Few landscaped grounds were found and indoor toilets were rare and confined solely to owners. Wide differences existed among owners and tenants relative to the possession of small or movable household equipment. Pressure cookers, radios, and sewing machines were almost universal items of housing equipment. Almost without exception, families of farm owners as a group rated higher than those of tenants on all items studied.

REPORTS AND PROCEEDINGS

Research and Farming: Sixty-seventh Annual Report [of North Carolina Station, 1944], L. D. BAVER. (Partly coop. U. S. D. A.). (*Res. and Farming* [North Carolina Sta.], 3 (1945), *Prog. Rpt. 4*, pp. 111, illus. 60).—In addition to an article on oats mosaic noted on page 487, this report deals with the progress of research in agricultural engineering, including the development of machines for distributing liquid forms of nitrogen, coal stokers for heating tobacco barns, and harvesters for sweetpotato vines; tobacco varieties, culture, diseases, and fertilizers; corn hybrids, culture, strains for insect resistance, fertilizers, and germination aids; cotton, including planting rates, cover crops, seed treatment, fiber structure and quality, fertilizers, and varieties; pastures and forage, including studies with lespedezas, alfalfa, Bermuda grass, brome grass, meadow fescue, crimson clover, kudzu, orchard grass, Kentucky bluegrass, redtop, dallis grass, and pasture management; peanuts, including strains, calcium and nitrogen requirements, potash application, and dusting for bacterial pustule and downy mildew; soybeans, including seed treatment, varieties, and needs for potash, magnesium, copper, and boron; small grains, including culture and fertilizer needs, oats, barley, and rye varieties, and disease-resistant wheats; forest grazing studies; small fruits, including drought-resistant dewberries, strawberry varieties, culture, and relation of age of plant to yield, and control of blueberry mites with lime-sulfur; truck crops, including use of surplus potatoes for silage and drying, susceptibility to bacterial soft rot, control of Southern bacterial wilt with soil treatments, value of minor elements, DDT and dinitro- σ -cyclohexylphenol dusts for insect control; nutritive value of brined vegetables, tomatoes resistance to bacterial wilt, cabbage seed production, cucumbers for pickling, cauliflower as a fall crop, treatments for lettuce damping off, and control of pea aphid and root knot of vegetable crops; peaches, including treatment with ethylene dichloride emulsion, use of minor elements, and variety tests; flowers and nursery, including tests of the western sand cherry, wild peach seedlings, and *Rhus virens*,

and fertilizers for ornamentals; beef cattle, including winter maintenance, protein supplements, creep feeding calves on reed pasture, and continuous v. rotational grazing on reeds; dairying, including sweetpotato vine silage and resistance of calves to stomach worms; hogs, including control of rancidity in cured meat and the use of soybeans and supplements; sheep, including soybean hay and beans for wintering ewes and developing a breed adapted to North Carolina; turkeys, including breeding, mortality, and pullorum disease; chickens, including the use of synthetic riboflavin, crossbreds as layers and broilers, and improved strains; nutrition, including riboflavin in soybeans, cystine and yeast as supplements, protein, Ca, and P in lespedeza, vitamins in sweetpotatoes and yams, and nutritive value of collards; economics, including postwar adjustments, cost of operating farm tractors and equipment, value of recommended practices, and poultry marketing facilities; social problems, including neighborhood leadership, rural medical care, and impact of the war on farm population and manpower; and soil conservation, including use of mulches and fertilizers.

MISCELLANEOUS

Statistical methods—applied to experiments in agriculture and biology, G. W. SNEDECOR (*Ames: Iowa State Col. Press, 1946, 4 ed. [rev.], pp. 485+, illus. 25*).—In this revision (E. S. R., 84, p. 858), emphasis is placed on theoretical conditions, with greater reliance on experimental sampling to exemplify statistical theory. Split plot and factorial design is included for further analysis of experimental data by statistical methods.

British agriculture in wartime, D. B. JOHNSTONE-WALLACE. (Cornell Univ.). (*N. Y. Farmers, Proc. 1944-45, pp. 410-425, illus. 4*).—An illustrated address based largely on the author's observations in 1943 and 1944.

Farm and Home Science [September 1945] (*Farm and Home Sci. [Utah Sta.] 6 (1945), No. 3, pp. 12, illus. 8*).—In addition to several articles noted elsewhere in this issue, this number contains Agriculture and the Postwar Period, by W. P. Thomas and G. T. Blanch (pp. 1, 2, 4), and Growing Livestock and Big Game on the Range, by L. A. Stoddart and D. I. Rasmussen (p. 12), the latter a summary of Circular 121 (E. S. R., 94, p. 81).

NOTES

Alabama College and Station.—Dr. William E. Sewall, professor of animal husbandry and animal husbandman, has resigned to engage in commercial work.

Tuskegee Institute.—According to a note in *Science*, a grant from commercial sources of \$5,400 has been made for a 2-year study by graduate assistants in chemistry and poultry husbandry of mung bean and other special proteins for poultry feeding.

California University and Station.—Dr. Herbert J. Webber, widely known for his contributions to plant breeding and long associated with the university and station, died February 18 at the age of 80 years. A native of Michigan, he received from the Nebraska University the B. S., A. M., and Agr. D. degrees and the Ph. D. degree from Washington University of St. Louis, and served as instructor in botany in both institutions. In 1892 he became a plant pathologist in the U. S. Department of Agriculture, and in 1900 was designated as physiologist in charge of the plant breeding laboratory. Resigning in 1907, he served until 1912 in Cornell University as professor of plant biology, acting dean of the College of Agriculture, and professor of experimental plant breeding. In 1913 he was appointed dean of the graduate school of tropical agriculture in California and first director of the Citrus Experiment Station, and from 1919 to 1920 was director of the California Station. After a period in 1920-21 in commercial work in South Carolina, he returned to the institution as professor of subtropical horticulture and director of the Citrus Station. In 1923-23 he served as acting dean of the College of Agriculture and then as investigator of citrus problems for the British Government and explorer and plant collector in South Africa for the U. S. Department of Agriculture. From 1929 to 1936 he was again professor of subtropical horticulture, retiring as professor emeritus in 1936.

Fred W. Lorenz, assistant professor of poultry husbandry and assistant poultry husbandman at Davis, has resigned to engage in research in physiology and endocrinology in a commercial laboratory.

Iowa College.—Following a grant for basic research on maize and other crops by an Iowa seed company, the establishment of a Tropical Research Center at Antigua, Guatemala, is announced to serve as a center of operations for research and for instruction to a limited number of students. The research will relate to the broader aspects of agriculture and the natural sciences, with the initial emphasis on maize and other plants known to be native to southern Mexico and Central America. It is expected to result in a hardier variety of corn for Midwest farmers, resistant to drought, disease, and insects, and also in the improvement of the quality and yield of Guatemalan corn.

Funds for the buildings and land for the research center have been provided by an organization of Guatemalan citizens who have formed the Hacienda Company, Inc., with a capital of \$100,000. Construction has been begun with the hope of opening by July 1. The cost of operating the center is estimated at about \$30,000 per year. It is expected that the college will maintain a resident director and a small staff at the center during most of the year.

Kansas College and Station.—Recent appointments include Dr. Eric Kneen as professor of milling industry; Lot F. Taylor, as extension assistant professor of animal husbandry; and Frances Templeton as research assistant in home economics.

Michigan College.—Gifts aggregating \$1,100,000 have been received for the construction and operation of a conference-hotel building. Of this amount \$100,000 has been contributed by the American Hotel Association to promote inn facilities to be operated by the college department of hotel administration as a part of the project and to house the association's research testing laboratory established on the campus in 1943. The W. K. Kellogg Foundation has granted \$1,000,000 over the next 5 years, of which \$150,000 is to be used for the construction, equipment, and development of facilities and \$250,000 for developing the program and employing the necessary personnel. The building will provide auditorium, lodging, and feeding facilities and similar services for those in attendance on conferences, short courses, etc.

A gift of \$15,000 from commercial sources is announced for a 2-year study of the microscopic anatomy of fowl to be carried on by the college in cooperation with the U. S. D. A. Regional Poultry Research Laboratory.

Minnesota University and Station.—Dr. F. R. Immer, plant breeder and assistant director of the station, died February 2 in his forty-sixth year. A native of Iowa, he completed his education at the University with the Ph. D. degree in 1927. Aside from several months spent abroad with the U. S. Air Forces in 1944, his professional work had been carried on in Minnesota, beginning in 1924 and including service since 1941 as associate director of the station. His research was largely in plant breeding, with special stress on statistical analysis of research results. His work has thrown new light on Minnesota grains, their disease resistance, quality, yield, and other features, and has been reported in over 50 publications. He was also coauthor of *Methods of Plant Breeding*, 1942.

Director C. H. Bailey has been awarded the Nicholas Appert medal of the Institute of Food Technologists in recognition of his services as director of research in food chemistry and his participation in national programs for improvement of food processing.

Mississippi College and Station.—The retirement is noted of Dr. William F. Hand as station chemist and dean of the school of science, but with the proviso that he will continue to serve as vice president. He had been professor of chemistry and State chemist since 1899 and dean since 1916. He has been succeeded in these capacities by Drs. Clay Lyle and M. P. Etheridge, respectively.

Rutgers University.—The university is cooperating with the U. S. Army Quartermaster Corps and nine pharmaceutical manufacturers in an extensive research program which is making basic studies of the properties and therapeutic values of protein hydrolysates and amino acids. A staff of 24 persons, including 12 full-time investigators and 7 consultants, is participating in the project. A one-story fireproof building with about 8,000 square feet of floor space is being planned for erection when building conditions permit.

Cornell University and Station.—Dr. A. F. Ross, biochemist in the Maine Station, has been appointed associate professor of plant pathology effective April 1.

New York State Station.—Dr. Robert E. Foster has been appointed assistant professor of plant pathology. Kenneth C. Holgate has been appointed research associate in food science and technology to carry on investigations in maple products.

North Carolina College.—A recent issue of *Research and Farming* notes that The Agricultural Foundation, Inc., has been organized with its primary objective "to improve all phases of agriculture in North Carolina in order to increase the per capita income of the farmer." It is expected that funds raised by contributions from organizations and individuals in the State will be available to the college for specific projects and as supplements to existing resources in fields needing special assistance.

Pennsylvania College and Station.—H. Clyde Knandel, associated with the poultry department since 1916 and head of the department from 1920 to 1944, died December 18, 1945, in Lancaster, Pa., in his fifty-fifth year. He was a native of New York, and a graduate in 1914 of Cornell University. For the past 2 years he had been in commercial work. He was the author of *Profitable Poultry Keeping*, 1943.

South Dakota College.—*Science* notes that President Lyman E. Jackson has been appointed dean of agriculture in the Pennsylvania College.

Veterinary Research Fund.—The American Veterinary Medical Association is soliciting funds for increased research in its field. The goal set is \$100,000 from members of the veterinary profession in the United States and Canada, with supplementary contributions to be sought later from animal lovers, livestock owners, commercial agencies, and others. The fund will be administered by the association's research council and will be used both to promote research projects and to train research personnel through graduate fellowships.

Nutritional Research Program in the Caribbean Area.—A joint project of the Massachusetts Institute of Technology and the Pan American School of Agriculture of Honduras is being undertaken with a view to developing in the area diets of native foods which are easy to produce and supply at low cost the necessary proteins, calories, minerals, and vitamins for adequate human nutrition. Among other phases, specimens of edible plants of Middle America, with notes on their characteristics, distribution, and uses, will be collected and sent to laboratories of the institute for analysis.

New Agricultural Institute for South Brazil.—The third of a proposed system of five regional research centers has been established near Pelotas in the southern part of the State of Rio Grande do Sul and will be known as the Southern Agronomic Institute. It will concern itself with broad agronomic programs of the States of Rio Grande do Sul, Santa Catharina, and Paraná, and will also function as the coordinating agency of the five federal experiment stations already in operation in this area. A tract of nearly 3,600 hectares has been purchased of varied terrain and agricultural possibilities. Jason R. Swallen of the U. S. D. A. has been loaned to the institute for a year's survey of the vegetation of the region. Dr. J. Rouget Perez has been appointed director.

Station Shipments of Fruit Tree Cuttings to the Soviet Union.—Three cases of cuttings have been contributed to Russian Relief by the New York State, Missouri State Fruit, and Minnesota Experiment Stations. These include 100 varieties of apples, 22 of grapes, 26 of cherries, 25 of pears, 31 of peaches, and 45 of lemons. Grafting and setting will be done under supervision of Soviet agricultural and horticultural experts.

In return, Russian experiment stations are to send to this country cuttings from a number of varieties of fruits, particularly scions from hardy apples, grapes, plums, and peaches for comparison with sorts already grown. It is recalled that several shipments of planting stocks had been made in the years preceding the war, particularly of grapes, plums, and peaches, some of which are being used as parent varieties in the fruit breeding work.

Scientific Institutions in the Ukraine.—Laboratory and other facilities of the Ukrainian Agricultural Institute at Kharkov were severely damaged during the war, and much repair work is under way. Some teaching has now been resumed, as well as experimentation in apple breeding and selection, cultural methods, and crop rotations. The institute has two field stations, located at Krasnograd with 650 hectares of land and 26 specialists, and Volkovska with 220 hectares and 9 specialists. Much of the work is with beans, peas, kok-saghyz, buckwheat, and proso. An extension service is directed from the institute, primarily for the benefit of a chain of 175 collective farms, and with a staff of 40 specialists. Sections are also devoted to

research and teaching in phytopathology, plant physiology, agricultural chemistry, and agricultural economics. Nearly all of the institute library of 25,000 volumes was evacuated, and some 20,000 volumes have been returned.

Several other agricultural institutions which before the war had separate maintenance in Kharkov are now housed in the institute's headquarters building. The Institute of Mechanization maintains an experiment station farm near the city and is testing farm machinery from the United States and elsewhere.

The Ukrainian Selection and Genetics Institute at Odessa was moved to Tashkent. The plant was occupied by Rumanian forces and remained comparatively intact until the withdrawal of the Axis forces, at which time the library and most of the laboratories were destroyed.

Personnel of the Ukrainian Institute of Grapes and Wines near Odessa were also evacuated to Tashkent, but damage was restricted and the laboratories have since been restored with German equipment. The Kharkov State Selection Station suffered little major damage, although its library and some laboratories have not thus far been restored. In the past this has been mainly a testing and seed-production station, but it has now begun to undertake research.

Agricultural Mission to the Near East.—The United States Government, through its Departments of State and Agriculture, is sending an agricultural mission to certain countries in the Near East which are seeking agricultural advice and assistance. The primary purpose is to survey the agricultural situation in conjunction with local authorities in order to indicate possibilities of long-term developmental projects which might be undertaken by Near Eastern governments independently or in collaboration with the U. S. Government or private American and local institutions. The members of the mission are President F. S. Harris of the Utah College, Dean and Director R. E. Buchanan of the Iowa College and Station, and Dr. Afif Tannous of the U. S. D. A. Office of Foreign Agricultural Relations.

Increased Demand for Trained Research Personnel in India.—In recognition of the important role which agricultural research will play in the postwar period, the Government of India has decided to expand its facilities for postgraduate training at the Imperial Agricultural Institute. It is hoped to admit 50 students in 1946 as compared with 12 in previous years. Postgraduate training in agricultural engineering and agricultural economics and statistics is being introduced.

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RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The immunochemistry of allergens, I-VI. (U. S. D. A.). (*Jour. Immunol.*, 41 (1941), No. 4, pp. 375-381; 46 (1943), No. 6, pp. 347-389, illus. 17; 47 (1943), No. 6, pp. 443-452, illus. 2; 49 (1944), No. 2, pp. 99-116, illus. 3).—

I. *Anaphylactogenic properties of a proteic component of cottonseed*, E. J. Coulson, J. R. Spies, and H. Stevens (pp. 375-381).—Anaphylactogenic properties of three products obtained in the fractionation and purification of the principal allergenic component of the cottonseed embryo were investigated. Fractions designated CS-1, CS-5 (a picrate) and CS-13 (proteic component of CS-5 free from picric acid) were shown to cross-react with each other and with unfractionated aqueous extract of cottonseed.

II. *Antigenic studies by the Dale method of the electrophoretic fractionation products of the protein-carbohydrate fraction, CS-1A, from cottonseed*, E. J. Coulson, J. R. Spies, and H. Stevens (pp. 347-365).—In a study of the antigenic relationships of the electrophoretic fractionation products of the allergenic protein-carbohydrate fraction CS-1A from cottonseed, fraction CS-51R (picric acid-precipitable cathodic fraction) was found to be antigenically indistinguishable from CS-56R (picric acid-precipitable anodic fraction). Fraction CS-56S, separated from the mother liquor in the picric acid fractionation of the anodic fraction, was found to contain antigen unrelated to CS-51R or CS-56R. A refractionated carbohydrate-free cathodic fraction, CS-60C, was antigenically indistinguishable from CS-51R. Carbohydrate did not appear, therefore, to play any part in determining antigenic specificity. The antigenic specificity of fractions CS-51R and CS-56R was not altered by the procedure of isolation. Both appear, therefore, to be preformed, native proteins.

III. *Anaphylactogenic potency of the electrophoretic fractionation products of CS-1A from cottonseed*, E. J. Coulson and J. R. Spies (pp. 367-376).—Data from estimations of the anaphylactic sensitizing and shocking capacities of allergenic fractions from cottonseed and of ovalbumin were used for the construction of dosage-response curves. Values for median lethal doses (LD 50) and median sensitizing doses (SD 50) were computed. On the basis of nitrogen content the shocking capacities for electrophoretic fractionation products of CS-1A and for ovalbumin were all of the same order. However, large differences were found in their sensitizing potency. Thus the sensitizing capacity of the high carbohydrate-

¹The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied on request.

containing fraction, CS-56R, was eight-fold greater than that of the low-carbohydrate fraction, CS-51R. Inasmuch as these two fractions have the same antigenic specificity, the greater sensitizing power of CS-56R was attributed to its larger molecular structure resulting from the high proportion of combined polysaccharide. The sensitizing capacity of ovalbumin was ten-fold greater than that of CS-56R.

IV. *Effect of dilute acid on anaphylactogenic activity, specificity, and reagin-neutralization capacity of cottonseed allergenic fractions*, E. J. Coulson and J. R. Spies (pp. 377-389).—The effect of boiling ≈ 10 HCl on antigenic properties and reagin-neutralization capacity of the electrophoretic fractionation products of the cottonseed-allergenic fraction, CS-1A, was investigated. These acid-treated fractions had previously been found to be unaltered in activity when compared by cutaneous tests on cottonseed-sensitive patients. On the basis of nitrogen content, fraction CS-51R lost 54 percent of its original capacity to elicit anaphylactic shock in sensitized animals and lost 78 percent of its capacity to induce sensitization. Fraction CS-56 lost 66 percent of its shocking potency and 97 percent of its sensitizing capacity. The specificity of the cathodic fraction CS-51R was unaltered by the acid treatment. The anodic fraction, CS-56, acquired a slightly altered specificity although the original specificity was predominant. The *in vitro* reagin-neutralization potency of the acid-treated fraction, CS-51RH, was diminished by more than 95 percent. The differences in the degree of destruction of antigenic activity, as measured by ability to shock sensitive animals on the one hand and to induce sensitization on the other, were presumed to indicate that antigenic structural features required to sensitize are not identical with those required to shock. Similarly, structural features required to elicit specific cutaneous reactions in allergic individuals are different from those required to neutralize reagins.

V. *Comparison of the rates of dialysis of crystalline ovalbumin and of the cottonseed allergen, CS-1A*, E. J. Coulson, J. R. Spies, and H. Stevens (pp. 443-452).—The authors determined the comparative rates of dialysis of ovalbumin and of the cottonseed allergen fraction CS-1A, finding the last-named fraction to be detectable, by gross anaphylaxis in the dialysates from mixtures of ovalbumin and CS-1A, and from mixtures of ovalbumin and cottonseed extracts, or from a solution of CS-1A alone, 30 min. after the beginning of dialysis. Ovalbumin could not be detected in dialysates from these mixtures or from a solution of ovalbumin alone until dialysis had proceeded for a week or more. The fraction CS-1A therefore contained a readily diffusible antigen. The predominant antigen found in the dialysate from the unfractionated aqueous extract of cottonseed was closely similar to the allergenic proteinaceous fraction CS-51R or was identical with it.

VI. *Anaphylactogenic properties of a proteic component of kapok seed and the relationship of kapok-seed antigens to cottonseed antigens*, E. J. Coulson, J. R. Spies, and H. Stevens (pp. 99-116).—A protein-polysaccharidic fraction, designated KS-1A, was isolated from kapok seed by a procedure like that used to isolate the fraction designated CS-1A from cottonseed. KS-1A was shown to be a preformed, native protein.

Three antigens common to the cotton and kapok seeds were demonstrated. Fraction KS-1A was shown to contain a small amount of antigen which reacted like and is probably identical with CS-51R from cottonseed. Serological tests indicated that KS-1A contained in the order of 0.05 to 0.1 percent of protein immunologically similar to CS-51R. A second common antigen, distinguished from CS-51R or KS-1A, was shown to be present in the aqueous extracts of kapok seed and cottonseed. The third common antigen, distinguished from CS-51R and KS-1A and distinguished also from the second water-soluble common antigen, was present in saline extracts and was associated with the globulin-fraction of kapok seed and cottonseed.

Dipole moments of some sex hormones, sterols, and isophorone, W. D. KUMLER and G. M. FOHLEN. (Univ. of Calif.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 3, pp. 437-441, illus. 3).—The dipole moments of eight androstane derivatives, four sterols, and isophorone were measured in dioxane solution and are here given. The moments of four of these compounds fell outside the range calculated for free rotation of the hydroxyl groups, indicating the 3 β - and the 17 β -hydroxyl groups do not have freedom of rotation. Other physico-chemical implications of the data obtained are noted and discussed.

There appeared to be no correlation between the dipole moments of the sex hormones and their physiological activity.

The mechanism of the antibiotic action of clavacin and penicillic acid, W. B. GEIGER and J. E. CONN. (N. J. Expt. Stas.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 1, pp. 112-116).—The antibiotic activities of clavacin and of penicillic acid were found probably due to their reaction with the sulfhydryl groups of bacterial enzyme systems or with sulfhydryl-containing metabolites essential to the bacteria. Clavacin and penicillic acid were inactivated by an excess of a sulfhydryl compound. Clavacin and penicillic acid, when present in excess, abolished the nitroprusside reaction of cysteine or thioglycolic acid. Certain synthetic α , β -unsaturated ketones, particularly acrylophenone, closely resembled clavacin, both in their bacteriostatic and fungistatic properties and in their reactivity toward sulfhydryl compounds.

The effect of environmental temperature and potassium iodine and supplementation on the excretion of iodine by normal human subjects, H. SPECTOR, H. H. MITCHELL, and T. S. HAMILTON. (Univ. Ill.). (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 137-143).—The concentration of iodine in undiluted sweat was 0.95 γ per 100 cc. A single dose of 2 mg. of KI increased the average concentration to 3.18 γ per 100 cc., while 14 daily doses of 2 mg. of KI did not produce any significant additional increase. Profuse sweating (averaging about 677 gm. per hour) increases dermal losses of iodine at high levels of iodine intake (2,200 γ per day, KI dosage), but at low levels (700 γ per day) no consistent or considerable effect was observed. The effect of a sweating environment on urinary output of iodine was too variable to permit a general statement, but no evidence that a sweating environment will increase iodine requirements was obtained. At least three-fourths of the total iodine lost from the body was excreted through the urine. When the iodine intake was increased with KI supplementation, most of the increased excretion of iodine was lost through the urine. The fecal excretion of iodine was greater under hot moist than under comfortable conditions at high levels of iodine intake, but not at the basal levels. Iodine dosage raised the fecal output of iodine significantly in a hot moist, but not in a comfortable, environment.

Fish poisons from *Ichthyomethia piscipula*.—I, A. RUSSELL and E. A. KACZKA (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 4, pp. 548-550).—Extraction of the root bark or root wood of *I. piscipula* with petroleum ether was found to give a mixture of crystalline materials very toxic to goldfish. Rotenone and a compound designated "ichthynone" were isolated and purified. Ichthynone crystallized difficultly from ethanol in sturdy hexagonal rodlets of m. p. 203°-204° [F.] It was found to have the molecular formula $C_{20}H_{20}O_7$ and to be an unsaturated ketone containing two methoxyl groups. Ichthynone killed goldfish at a concentration of approximately one part in a million.

Esterification of proteins with alcohols of low molecular weight, H. FRAENKEL-CONRAT and H. S. OLCOTT. (U. S. D. A.). (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 259-268).—Carboxyl groups of proteins and model substances were readily methylated at room temperature in methyl alcohol containing small amounts of mineral acids (0.02 to 0.1 N). The catalytic activity of acid chlorides in esterification was found due to the liberation of hydrochloric acid. The acid-catalyzed reaction

of proteins with methanol appeared to be a specific one involving only the carboxyl groups; amino, phenolic, thiol, and indole groups and peptide and amide bonds were unaffected. Esterification occurred also with higher primary alcohols, but was slower and progressively less complete than with methanol. Several proteins dissolved in the alcohols during the reaction.

Action of aromatic isocyanates on proteins, H. FRAENKEL-CONRAT, M. COOPER, and H. S. OLCOTT. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 2, pp. 314-319).—When proteins were treated with aromatic isocyanates under anhydrous conditions and in the presence of pyridine, reaction occurred with: (1) The basic groups, including amino, guanidyl, and imidazole; (2) the acid groups, including carboxyl, thiol, and phenolic; and (3) the primary amide and probably part of the aliphatic hydroxyl groups. Under the same conditions the peptide groups of chain molecules did not react appreciably, in contrast to the simple diketopiperazines which bind two molecules of phenyl isocyanate. A method designed for quantitative liberation of the primary amide, amino, and the guanidyl nitrogen by the action of nitrous acid in mineral acid was applied successfully to proteins. This reaction made possible estimations of the extent of interaction of amide groups with phenyl isocyanate. The products of the anhydrous reaction of phenyl isocyanate with alanine and with glycine and alanine anhydrides are described.

An amine formed by bacteria during sulfonamide bacteriostasis, M. R. STETTEN and C. L. FOX, JR. (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 333-349, *illus.* 1).—When the normal growth of certain bacteria was inhibited by bacteriostatic concentrations of sulfonamide drugs, a diazotizable was found to accumulate in the medium. From cultures of *Escherichia coli*, of which the growth was inhibited by either sulfadiazine or sulfapyridine, the amine was isolated as a picrate and samples of the free amine and a number of derivatives prepared. It was a heterocyclic orthodiamine having the empirical formula $C_6H_8N_2O$. The possibility of its being a pyrimidine was eliminated. Its properties indicated that it was probably 2-hydroxy-5, 6-diaminopyrazine.

The reaction of glucose with some amines, E. MITTS and R. M. HIXON. (Iowa State Col.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 3, pp. 483-486).—Glucosylalkylamines were prepared by direct reaction of glucose with the amine, and glucamines by catalytic hydrogenation with the aid of Raney nickel, the hydrogen pressure being from 800 to 1,300 lb. per square inch and the temperature below 100° [C.], usually between 70° and 83°. Most of the compounds of both types crystallized. The glucamines formed from primary amines of intermediate molecular weight are good wetting agents. An approximation of the degree of hydrolysis of the various N-substituted glucosides was made by comparison of changes in rotation, by potentiometric titration, and by extraction of the hydrolyzed amine. With the exception of the first member of the series, *l*-aminoglucose, ease of hydrolysis appears to parallel the K_b of the nitrogen substituent. An attempt was made to effect the Amadori rearrangement of the glucosylalkylamines and the acyl derivatives of *l*-aminoglucose. No rearranged product could be isolated in either case. The *p*-toluidide and phenylhydrazine derivative of 2-methylglucose were prepared. The methoxyl group on the second carbon atom prevented rearrangement of the *p*-toluidide, but glucose phenylosazone was prepared from the phenylhydrazine derivative of 2-methylglucose.

The structure of the "B" modification of starch from film and fiber diffraction diagrams, R. E. RUNDLE, L. DAASCH, and D. FRENCH. (Iowa Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 1, pp. 130-134, *illus.* 2).—Methods for preparing films and fibers of the B modification of starch are outlined. Film and fiber diffraction patterns of the B modification of starch were prepared. The fiber axis was 10.6 Å. A new unit cell for the B modification was found $a_0 = 16.0$, $b_0 = 10.6$, $c_0 =$

9.2 Å. The structure is probably orthorhombic. There are eight glucose residues per unit; the density of the crystalline portion of starch is about 1.6 gm. per cubic centimeter. A rough structure of the B modification of starch was proposed on the basis of the unit cell dimensions and qualitative consideration of the intensities. It is pointed out that plasticizers useful in producing starch fibers generally alter the starch structure materially, and unlike that of cellulose, the fiber spacing of starch is easily altered by treatment of the starch.

On the nature of the starch-iodine complex, R. E. RUNDLE, J. F. FOSTER, and R. R. BALDWIN. (Iowa Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 12, pp. 2116-2120, illus. 2).—On the bases of the structure of amylose-iodine and of the results of potentiometric and spectrophotometric titrations of starch and of its components with iodine, a probable mode of interaction between amylose and iodine is suggested. The proposed mechanism successfully explains changes in the stability and color of the amylose-iodine complex concomitant with changes in the amylose chain-length. Some application of the proposed hypothesis as an explanation of the formation of some other blue iodine complexes is made.

The relation of starch-iodine absorption spectra to the structure of starch and starch components, R. R. BALDWIN, R. S. BEAR, and R. E. RUNDLE. (Iowa Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 1, pp. 111-115, illus. 5).—Differences between absorption spectra were found to confirm the difference between amylose and amylopectin in their behavior toward iodine. The differences in individual amyloses and amylopectins from different starches make a simple colorimetric analysis for the two components unreliable, however. The amount of iodine bound in complex formation with amylose increases as the concentration of iodine decreases, becoming one iodine molecule for six glucose residues for infinitely dilute iodine solutions.

It was found that the wave length of maximum absorption of an amylose solution shifts toward the red as the chain length of the amylose is increased. The shift is in the same direction when the lengths of the unbranched portions of an amylopectin are increased. An increase in the molecular extinction coefficient accompanies an increase in the length of an amylose or an increase in the lengths of the unbranched portions of an amylopectin. Both these properties permit the relative evaluation of molecular weight of an amylose and degree of branching of an amylopectin. The change in the molecular extinction coefficient is the more sensitive.

The rôle of maltase in the enzymolysis of raw starch, S. SCHWIMMER. (U. S. D. A.). (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 219-234, illus. 5).—The complementary action of *Aspergillus oryzae* in the enzymolysis of raw starch by the α -amylase of pancreas was traced to the α -glucosidase (maltase) present in the mold. The effect of varying α -amylase and maltase concentrations on the extent, course, and initial rate of hydrolysis was determined. These observations were compared in turn with the action of the same enzymes on cooked starch. Variations from a standard reaction system were made by increasing the concentration of amylolytic enzymes during the course of hydrolysis, and by adding or removing maltose and glucose.

The observations made were interpreted to mean that the maltase decreased the operation of the following factors which tended to prevent complete conversion by the α -amylase: irreversible inactivation, reversible inhibition by maltose, resynthesis from maltose, slow rate of hydrolysis of the "abnormal" linkages present in the amylopectin. Whereas the difference in the action of α -amylase on raw and cooked starch seemed to be one of rate imposed upon the system by the limited substrate available, the complete lack of susceptibility of the starch granule to attack by β -amylase was attributed to the masking (by strong hydrogen bonding) of the non-reducing end of the glucose chains.

A study of the essential groups of β -amylase, I, II, C. E. WEILL and M. L. CALDWELL (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 2, pp. 212-217, illus. 1).—These papers of this series deal with the effects of reagents capable of destroying or blocking certain chemical groups in the molecule of the enzyme named.

Paper 1 (pp. 212-214) reports upon the effect of nitrous acid upon the activity of the β -amylase from barley and from malted barley; and on the influence of acetylation with ketene upon the amylase activity of the enzyme and upon the amino nitrogen content of β -amylase solutions. The results indicated that free sulfhydryl and free tyrosine groups are essential, whereas free amino groups are probably not essential to the activity of the β -amylase obtained either from barley or from malted barley.

II. **Sulfhydryl groups** (pp. 214-217).—This paper adds further evidence of the importance of free sulfhydryl groups in the activity of β -amylase, treatment of the enzyme with reagents generally held to react specifically with sulfhydryl groups causing a marked inhibition of the enzymic activity. Activity inhibited by two arylmercuric compounds was largely or completely restored by subsequent treatment with hydrogen sulphide or with cysteine.

Further studies of the purification and properties of the amylase of *Aspergillus oryzae*, M. L. CALDWELL, R. M. CHESTER, A. H. DOEBBELING, and G. W. VOLZ (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 361-365).—The authors report upon an extensive study of the purification of the amylase of *A. oryzae*, describing a procedure which yielded preparations having very high amylase activities. These highly active products gave no evidence of maltase activity, and were found suitable for use in studies of the action and properties of the amylase.

Relationship between solution viscosity and molecular weight in the amylose series, J. F. FOSTER and R. M. HIXON. (Iowa Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 4, pp. 557-560, illus. 3).—Osmotic pressure values for the amyloses of corn and of tapioca were determined. Molecular weights of further members of the series were estimated from other considerations. A dependence of intrinsic viscosity on a power of molecular weight greater than unity was indicated, confirming expectations from the comparative rigidity of Fischer-Hirschfelder models of amylose. The rigidity of acetylated amylose molecules in chloroform appeared to be the same as that of amylose in ethylenediamine.

Formation of isomeric hydroxy acids by sulfation of oleic acid, B. B. SCHALITZER, E. T. ROE, J. A. DIXON, and W. C. AULT. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 11, pp. 1924-1925).—Hydroxyl acids resulting from the sulfation and subsequent hydrolysis of oleic acid were oxidized with nitric acid. Esters of dibasic acids having more than 10 carbon atoms were found by fractionation of the methyl esters of the steam-nonvolatile, water insoluble portion. The dimethyl ester of 1,14-tetradecanedicarboxylic acid was isolated and identified. Esters of monobasic acids longer than decanoic appeared to be present. The sulfation of oleic acid was found to lead not only to 9- and 10-hydroxystearic acids but also to other isomeric hydroxy acids.

Epoxidation of oleic acid, methyl oleate, and oleyl alcohol with perbenzoic acid, D. SWERN, T. W. FINDLEY, and J. T. SCANLAN. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 11, pp. 1925-1927).—In a large-scale laboratory procedure for the preparation of perbenzoic acid, benzaldehyde was oxidized in acetone solution by a stream of dry air under the influence of ultraviolet radiation, the yield of perbenzoic acid having been from 40 to 45 percent of the theoretical. This solution was satisfactory for the epoxidation of oleic acid, methyl oleate, and oleyl alcohol.

The method of preparing epoxystearic acid by co-oxidation of oleic acid with benzaldehyde was improved. The mole ratio of benzaldehyde to oleic acid was reduced from 27 : 1 to 10 : 1, and the isolation of 9,10-epoxystearic acid was simplified.

9,10-Epoxyoctadecanol, m. p., 54°–54.5° [C.], and a mixture of 9,10- and 10,9-chlorohydroxyoctadecanols, m. p. 61°–62°, were prepared for the first time.

Salts of residual dimerized fat acids: A new class of resinous substances, J. C. COWAN and H. M. TEETER. (U. S. D. A.) (*Indus. and Engin. Chem.*, 36 (1944), No. 2, pp. 148–152, illus. 2) —Certain salts, in particular the zinc, calcium, and magnesium salts, of residual dimerized fat acids were found to possess marked resinous properties. They were capable of forming fibers, films, and viscous solutions. These properties were attributed to ionic associations of divalent anions and cations into long chains. Approximate molecular weight determinations by viscometric methods indicated a value of about 15,000 in 10 percent solutions in pyridine. While fibers were apparently too weak to be of use, the film-forming properties were utilized in the formulation of shellac substitutes and varnish, the latter being compared with zinc resinate and ester gum varnishes.

Configuration of acetylmethylcarbinol, R. H. BLOM. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 3, p. 494) —It was found that in the vapor phase oxidation of D-(—)-2,3-butylene glycol the resulting acetylmethylcarbinol was levorotatory. "Although extensive racemization occurred during the reaction, the rotation of the product was sufficient to establish the configurational relationship. Since the glycol and the carbinol can exist in only two active forms, D- or L-, racemization would form only the racemic structures in both cases. The acetylmethylcarbinols and the 2,3-butylene glycols which exhibit the same sign of rotation therefore possess the same configuration." Structural formulae showing the configurations discussed are included.

Some salts of aconitic acid, J. A. AMBLER, J. TURER, and G. L. KEENAN. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 1, pp. 1–4). —The insoluble aconitates separating from sugarcane and sorgo sirups were identified as calcium magnesium aconitates having the optical-crystallographic properties of dicalcium magnesium aconitate hexahydrate, although they generally contain less than the theoretical proportion of magnesium. It is suggested that they are solid solutions of tricalcium aconitate hexahydrate with either trimagnesium aconitate or dicalcium magnesium aconitate hexahydrate. The preparation and properties of crystalline tricalcium aconitate hexahydrate, tricalcium aconitate, trihydrate, calcium sodium aconitate dihydrate, dicalcium magnesium aconitate hexahydrate, magnesium acid aconitate tetrahydrate, and zinc acid aconitate tetrahydrate are described. Optical-crystallographic properties and refractive indices of the salts named, and of tricalcium aconitate hexahydrate and monopotassium aconitate, are given.

Preparation and properties of the *n*-alkyl acrylates, C. E. REHBERG and C. H. FISHER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 7, pp. 1203–1207, illus. 2). —High *n*-alkyl acrylates having from 2 to 16 carbon atoms in the alkyl group were prepared in high yields by the alcoholysis of methyl acrylate. The monomeric esters were polymerized as emulsions, and the coagulated polymers were examined briefly to determine the influence of chain length of the alkyl group upon the properties of the polymer. As the chain length of the alkyl group increased, the polymers became softer and tackier at room temperature (up to and including tetradecyl acrylate). The polymer of *n*-hexadecyl acrylate was a wax-like solid at room temperature but soft and tacky above 35° C. As the molecular weights increased, the brittle points of the first eight polyalkyl acrylates became lower; beyond octyl acrylate, which had a brittle point of –65°, the brittle points became higher.

Preparation and properties of secondary and branched-chain alkyl acrylates, C. E. REHBERG, W. A. FAUCETTE, and C. H. FISHER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 10, pp. 1723–1724, illus. 1) —Various secondary and branched-chain alkyl acrylates were prepared in high yields by the alcoholysis

of methyl acrylate. Certain properties of the monomeric and polymeric acrylic esters were determined. A brief discussion of the relation between structure of the monomer and properties of the polymer is given.

Preparation and pyrolysis of lactic acid derivatives: Production of β -alkoxyethyl and tetrahydrofurfuryl acrylates, M. L. FEIN, W. P. RATCHFORD, and C. H. FISHER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 7, pp. 1201-1203).—The β -methoxyethyl, β -ethoxyethyl, β -butoxyethyl, and tetrahydrofurfuryl esters of lactic acid were prepared by direct esterification and by alcoholysis of ethyl lactate. Acetylation with acetic anhydride yielded the corresponding α -acetoxypropionates.

Thermal decomposition of the β -alkoxyethyl α -acetoxypropionates yielded the corresponding alkoxyethyl acrylates in yields of 26 to 47 percent, along with acetic acid, acetaldehyde, carbon monoxide, carbon dioxide, and hydrocarbon gases. A 70 percent yield of tetrahydrofurfuryl acrylate was obtained by the pyrolysis of tetrahydrofurfuryl acetoxypropionate.

Preparation and pyrolysis of alkyl α -acetoxypropionates: Effect of structure on yield of acrylic ester, C. E. REHBERG and C. H. FISHER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 1, pp. 56-57).—Lactates of several primary, secondary, and branched-chain alcohols were acetylated and the resulting acetoxypropionates were pyrolyzed, yielding the following alkyl acrylates in the order of decreasing quantities: β -Chloroethyl, isobutyl, 2-ethylbutyl, *n*-butyl, *n*-propyl, 2-ethylhexyl, ethyl, isopropyl, and cyclohexyl. Virtually no acrylic ester was obtained from the secondary alkyl acetoxypropionates. Yields of acrylates from the primary alkyl esters ranged from about 20 to 50 of the theoretical.

Raman spectra of two forms of allo-ocimene, J. J. HOPFIELD, S. A. HALL, and L. A. GOLDBLATT. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 1, pp. 115-118, illus. 2).—Two forms of allo-ocimene, designated as "A" and "B" were isolated. Both forms yielded with maleic anhydride the same adduct, but they exhibited differences in boiling point, freezing point, density, and Raman spectra. Both forms gave strong Raman spectra in an exceptionally short exposure time. Each could be detected in a mixture by the characteristic Raman lines at 1,365 cm^{-1} (A form) and 1,272 cm^{-1} (B form). The Raman spectra tended to support the interpretation that these forms are two of the four possible geometric stereoisomers of allo-ocimene.

The production of α - and β -pyronene from allo-ocimene, L. A. GOLDBLATT and S. PALKIN. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 4, pp. 655-656, illus. 1).—A portion of the pyrolysis product obtained at a reaction temperature of 400° [C.], under conditions specified, and in an apparatus described and illustrated in a partly dimensioned drawing, when fractionally distilled under reduced pressure, was found to contain about 30 percent of α -pyronene and about 45 percent of β -pyronene, together with some unchanged allo-ocimene, dimer, and other unidentified hydrocarbons. The fractions containing the highest concentrations of α - and β -pyronene had the following characteristics: α -Pyronene, b. p. 54°-56° at 20 mm., d_4^{20} 0.8272, n_D^{20} 1.4672; β -pyronene, b. p. 62°-64° at 20 mm., d_D^{20} 0.8481, n_D^{20} 1.4800. From these fractions the characteristic maleic anhydride adducts of the respective pyronenes could be obtained in excellent yield.

Allyl ethers of carbohydrates.—II, Preparation and polymerization of polyallyl ethers, P. L. NICHOLS, JR., and E. YANOVSKY. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 1, pp. 46-49, illus. 1).—Allyl ethers of D-mannitol, D-sorbitol, glycerol, ethylene glycol, 1,3-butylene glycol, dipropylene glycol, pentaerythritol, inositol, and sucrose were prepared, and their polymerization was studied. A possible mechanism of oxidation of allyl ethers of polyhydric alcohols is discussed.

Some quinolines patterned as "open models" of atabrine, H. GILMAN and S. M. SPATZ. (Iowa State Col.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 4, pp. 621-

625).—Four α -aryl- γ -chloroquinolines were conveniently prepared through a sequence of reactions involving (1) RLi addition to the anil linkage, (2) N-oxide formation of the anil addition product, and (3) halogenation of the latter with phosphorus oxychloride. Antimalarial activity in avian malaria was shown by 6-methoxy-2-(3'-chlorophenyl)-4-[(α -methyl- δ -diethylaminobutyl)-amino]-quinoline, and by the isomeric (4'-chlorophenyl) compound. The presence of chlorine is not a necessary condition for activity. 6-Methoxy-2-(phenyl)-4-[(α -methyl- δ -diethylaminobutyl)-amino]-quinoline is also active. The position of the methoxy group (in the non-chlorinated structure) is important, however. 2-(2'-Methoxyphenyl)-4-[(α -methyl- δ -diethylaminobutyl)-amino]-quinoline, unlike the 6-methoxy isomer, is inactive.

o-Biphenyl isocyanate, *o*-bicyclohexyl isocyanate, N,N'-di-*o*-biphenyl urea, N,N'-di-*o*-bicyclohexyl urea, H. FRAENKEL-CONRAT and H. S. OLCOTT. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 5, p. 845).—The isocyanates were prepared by the reaction of *o*-biphenylamine and *o*-bicyclohexylamine with phosgene in dry toluene.

The corresponding symmetrical disubstituted ureas were prepared by treating the isocyanates with water containing 10 percent of pyridine as a catalyst. The biphenyl compound reacted in the cold, but the bicyclohexyl isocyanate had to be heated on a steam bath.

Optical isomers of 2,3-butanediol produced by fermentation, G. E. WARD, O. G. PETTIJOHN, L. B. LOCKWOOD, and R. D. COGHILL. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 4, pp. 541-542).—*Levo*-2,3-Butanediol, possessing a specific rotation slightly in excess of -13.0° C., was isolated and identified as the chief substance formed by the action of a specified strain of *Bacillus polymyxa* on grain mash substrates. This optical activity is far in excess of values previously ascribed to the asymmetric 2,3-butanediols. In contrast to the *meso-dextro*-2,3-butanediol mixture produced in *Aerobacter aerogenes* fermentations, *levo*-2,3-butanediol was found to possess a relatively low viscosity and not to form a hydrate.

Configuration of the 2,3-butylene glycols, S. A. MORILL and A. H. AUERNHEIMER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 5, pp. 792-796).—In a study of the conversion of optically active 2,3-butylene glycols to butadiene, the intermediate methylvinylcarbinols were isolated. The sign of the rotation of each of these carbinols was the same as that of the glycol from which it was prepared. Hydrogenation to the corresponding methylethylcarbinol was also found to effect no change in the direction of the rotation. The configuration of dextrorotatory methylethylcarbinol having already been related to that of dextrorotatory lactic acid, which belongs to the L-series, the configuration of the active, 2,3-butylene glycols was established as D-(—) and L-(+).

The degradation of heavy-carbon butyric acid from the butyl alcohol fermenting, H. G. WOOD, R. W. BROWN, C. H. WERKMAN, and C. G. STUCKWISCH. (Iowa Expt. Sta. et al.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 11, pp. 1812-1818).—The oxidation by hydrogen peroxide of butyric acids having the carbon isotope of atomic weight 13 in the carboxyl group and in both the carboxyl group and position was investigated with the purpose of finding a method for selective isolation of fragments of the carbon chain of butyrate. The products of the oxidation, carbon dioxide, acetic acid, acetone, acetaldehyde, propionaldehyde, and an unidentified non-volatile compound were determined quantitatively and their C^{13} contents measured. Identification of the acetaldehyde and propionaldehyde was tentative. From $CH_3CH_2CH_2C^{13}OOH$ the only products that contained excess C^{13} were carbon dioxide and the non-volatile fraction. The other products, therefore, are formed from the α , β , and γ carbons of the butyric acid. From $CH_3C^{13}H_2CH_2C^{13}OOH$ each product was found to contain excess C^{13} . The excess C^{13} in the acetone was determined by iodoform degradation to be exclusively in the carbonyl group. By the use

of this type of degradation the C^{α} in the carboxyl and β positions of the butyrate can be measured quantitatively. The average of the α and γ carbons is also obtained. The exact origin of the acetic acid and acetaldehyde could not be definitely established. The $CH_3C^{14}H_2CH_2C^{14}OOH$ was isolated from butyl alcohol fermentations of corn mash to which $CH_3C^{14}OOH$ was added. It is pointed out that the distribution of the C^{α} in the molecule suggests that butyl alcohol is formed by a condensation of acetic acid or a derivative of it.

The preparation of cyclohexanols by catalytic reduction of phenols, H. E. UNGNADE and A. D. McLAREN. (Univ. Mo.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 1, pp. 118-122).—The authors found that alkylcyclohexanols are readily obtained by the hydrogenation of alkyl-, alkenyl-, and acylphenols in the presence of Raney nickel; that the hydrogenation of di-ortho substituted phenols is promoted by small amounts of alkali; that the hydrogenation of alkenyl and acylphenols may be conducted at low temperatures to give good yields of alkylphenols; and that the hydrogenation of acylphenols gives alkylphenols or alkylcyclohexanols depending upon the temperature. In the presence of alkali a mixture of alkylphenol and hydroxyalkylcyclohexanol is obtained at low temperatures and a mixture of alkylcyclohexanol and hydroxyalkylcyclohexanol at high temperatures.

The synthesis of optically inactive desthiobiotin, J. L. WOOD and V. DU VIGNEAUD. (Cornell Univ.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 2, pp. 210-212).—A method for the total synthesis of *dl*-desthiobiotin which appears to be a practicable procedure for obtaining the compound in quantity is described in working detail. The product obtained appeared to be a mixture of the two possible racemic forms. It had one-third of the activity of biotin in promoting the growth of yeast in a medium deficient with respect to biotin.

3,6-Epoxy cyclohexene from furan and ethylene, W. NUDENBERG and L. W. BUTZ. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 2, pp. 307-308).—The compound named was prepared by treating furan containing a very small proportion of hydroquinone with ethylene under 1,100 to 1,200 lb. pressure at room temperature, and then heating the bomb at 150° to 155° C. for 16 hr. Separated by fractional distillation, the 3,6-epoxy cyclohexene was obtained in the yield of from 5 to 8 percent, on the basis of the furan consumed in the reaction. The compound was characterized by hydrogenation and esterification of the resulting dihydroxy compound and by preparation of an *n*-phenyltriazoline. The boiling point of the epoxy cyclohexene was found to be 118°; n_D^{20} 1.4629.

Dichlorodiphenyltrichloroethane.—I, Solubility in various solvents, F. A. GUNTHER (Calif. Citrus Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 2, pp. 189-190, illus. 1).—The percentages by weight of pure DDT (2,2-bis-(*p*-chlorophenyl)-1,1,1-trichloroethane) soluble at 0°, 7.2°, 24°, and either 45° or 48° C. in acetone, benzene, carbon tetrachloride, chloroform, dioxane, ether, ethanol (95 percent), petroleum spirit, and pyridine were determined for the purpose of finding a stripping solvent suitable for use in estimating residues on the surface of treated objects. Approximate solubility curves for the solvents and temperature range specified are shown. Acetone, benzene, dioxane, and pyridine all showed somewhat similar solvent power for DDT, but immiscibility with water was considered an important factor; and the fact that DDT may decompose above its melting point excluded dioxane and pyridine because of their boiling points as well as their water solubility. Benzene is therefore considered the most efficient stripping solvent for DDT at room temperature (24°).

The relation of estrogenic activity to structure in some 4,4'-dihydroxydiphenylmethanes, E. E. REID and E. WILSON (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 6, pp. 967-969, illus. 1).—A number of 4,4'-dihydroxy-diphenylmethanes $(HOC_6H_4)_2CRR'$, were prepared and their estrogenic activities determined in order to relate their

activities to the size and character of the groups R and R'. For characterization, their benzoates were made.

Gliotoxin, the antibiotic principle of *Gliocladium fimbriatum*, II-IV. (Cornell Univ.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 4, pp. 614-621).—These three papers continue a series previously noted (E. S. R., 91, p. 375).

II. *General chemical behavior and crystalline derivatives*, W. F. Bruce, J. D. Dutcher, J. R. Johnson, and L. L. Miller (pp. 614-616).—The work recorded in this paper showed that a part of the carbon skeleton probably included that of indole-2-carboxylic acid. The presence of an N-methyl grouping was demonstrated. The lability of the sulfur atoms in gliotoxin made it difficult to secure crystalline reaction products. A number of reactions by which sulfur could be removed were discovered, including oxidation by bromine water, reaction with mercuric acetate and silver nitrate, and reduction by various acidic and neutral reducing agents. Three crystalline derivatives of gliotoxin were prepared: The di-benzoate, the di-*p*-bromobenzoate, and the di-*p*-nitrobenzoate. In each case, the formulation of the product agreed with the formulation of gliotoxin previously proposed.

III. *The structure of gliotoxin—degradation by hydriodic acid*, J. D. Dutcher, J. R. Johnson, and W. F. Bruce (pp. 617-619).—Treatment of gliotoxin with phosphorus and hydriodic acid in acetic acid gave a crystalline product in which analysis showed that no sulfur and two less oxygen atoms were present, but the same number of carbons as in gliotoxin were found. This product was degraded stepwise to N-(indole-2-carboxyl)-N-methyl- α -alanine and to indole-2-carboxylic acid. The crystalline reduction product, 2,3-dimethyl-1,4-diketotetrahydropyrazino-[1,2-*a*]-indole, and the several degradation products were identified by synthesis.

IV. *The structure of gliotoxin—the action of selenium*, J. D. Dutcher, J. R. Johnson, and W. F. Bruce (pp. 619-621).—The degradation of gliotoxin by selenium was shown to yield 2-methyl-1,3,4-triketotetrahydropyrazino-[1,2-*a*]-indole. The structure of this substance was determined by degradation and by synthesis. This formulation is in agreement with the structure of the product of the hydriodic acid reduction of gliotoxin previously published.

The preparation and purification of glucose 1-phosphate by the aid of ion exchange adsorbents, R. M. McCREADY and W. Z. HASSID. (Univ. Calif.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 4, pp. 560-563, *illus.* 1).—The authors report upon a method for preparation of dipotassium glucose-1-phosphate dihydrate by digesting a starch with crude potato phosphorylase in the presence of inorganic phosphate. The purification of the ester is accomplished by using ion exchange adsorbents.

The dielectric constants of solutions of glycine and pyridine betaine in water-dioxane mixtures, G. OSTER, D. PRICE, L. G. JOYNER, and J. G. KIRKWOOD (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 6, pp. 946-948, *illus.* 2).—The dielectric constants of solutions of glycine and of pyridine betaine in mixtures of water and dioxane were determined. The dielectric increments both of glycine and of pyridine betaine showed a regular decrease with decreasing dielectric constant of the solvent mixture. This decrease was similar to that exhibited by glycine betaine and the benzbetaines. The possibility of reversion of pyridine betaine to the un-ionized was examined. Calculations showed that the charged groups could approach each other (and thus account for the experimental results) only if the valence bonds were tremendously distorted.

A new synthesis of homocystine and a further improvement in the synthesis of methionine, H. R. SNYDER and G. W. CANNON. (Univ. Ill.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 4, pp. 511-512).—The authors found that 3,6-bis-(β -chloroethyl)-2,5-diketopiperazine is converted quantitatively to the bis-isothiuronium salt by treatment with thiourea in boiling ethanol. Treatment of the bis-isothiuronium salt with dilute alkali, followed by oxidation with air in the presence of ferric

chloride and hydrolysis with acid, provides a convenient synthesis of homocystine. Decomposition of the bis-isothiuronium salt with alkali in the presence of methyl sulfate produces *dl*-methionine. This method of converting the dichlorodiketopiperazine to *dl*-methionine is superior to that previously described.

Studies on 4-hydroxycoumarins, IV-VIII. (Wis. Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 6, pp. 900-909; 67 (1945), No. 1, pp. 99-107).—Five further papers continue a series previously noted (E. S. R., 91, p. 376).

IV. *Esters of the 4-hydroxycoumarins*, M. A. Stahmann, L. H. Graf, C. F. Huebner, S. Roseman, and K. P. Link (pp. 900-902).—A series of diesters of some 3,3'-alkylidene-bis-(4-hydroxycoumarin)s and of monoesters of 3-phenyl-4-hydroxycoumarin were prepared. The *o*-benzyloxybenzoic acid esters were converted to the corresponding salicylic acid esters by hydrogenolysis. The 3,3'-alkylidenebis-(4-hydroxycoumarin)s yielded 3,3'-alkylidene-4,4'-epoxydicoumarins upon treatment with sodium ethoxide.

V. *The condensation of α,β -unsaturated ketones with 4-hydroxycoumarin*, M. Ikawa, M. A. Stahmann, and K. P. Link (pp. 902-906).—Hydroxycoumarin was condensed with the following α,β -unsaturated ketones by the Michael type addition: Ethylidenacetone, mesityl oxide, benzalacetone, anisalacetone, vanillylalacetone, benzalacetophenone, benzal-*o*-hydroxyacetophenone, salicylalacetone, salicylalacetophenone, and 2,2'-dihydroxybenzalacetophenone. The condensations were carried out by refluxing in pyridine. The condensation products from salicylalacetone, salicylalacetophenone, and 2,2'-dihydroxybenzalacetophenone underwent spontaneous dehydration to 7-substituted 6-oxo-(1)benzopyrano(4,3-*b*)(1)-benzopyrans. The other condensation products (not included above) were converted to the corresponding cyclic methyl ketals by refluxing in methanolic hydrogen chloride.

VI. *Glucosides of 4-hydroxycoumarins*, C. F. Huebner, S. A. Karjala, W. R. Sullivan, and K. P. Link (pp. 906-909).—A series of glucosides of the 4-hydroxycoumarins was prepared. The glucoside acetates of 4-hydroxycoumarin, 4-hydroxy-6-methylcoumarin, 3-phenyl-4-hydroxycoumarin, and the monoglucoside acetate of 3,3'-methylenbis-(4-hydroxycoumarin) were prepared by treating the enol silver salts with acetobromoglucose. The diglucoside octaacetate of 3,3'-methylenbis-(4-hydroxycoumarin) and of 3-[6-oxo(1)-benzopyrano(4,3-*b*)(1)benzopyran-7-yl]-4-hydroxycoumarin glucoside tetraacetate were prepared by coupling the aglucone with acetobromoglucose in the presence of catalytic amounts of quinoline and an excess of silver oxide. The two 4-hydroxycoumarin, glucoside, tetraacetates unsubstituted on position 3 were successfully deacetylated by the catalytic barium methoxide procedure. The 3-substituted-4-hydroxycoumarin glucoside acetates underwent alcoholysis with the removal of the glucose residue involving a Walden inversion.

A course of reaction in which both glucoside residues were removed from 3,3'-methylenbis-(4-hydroxycoumarin) diglucoside octaacetate with the formation of 3,3'-methylene-4,4'-epoxydicoumarin and 3,3'-methylenbis-(4-hydroxycoumarin) monomethyl ether is proposed.

VII. *Reactions of 4-hydroxycoumarin with cationoid reagents*, C. F. Huebner and K. P. Link (pp. 99-102).—4-Hydroxycoumarin was shown to exist entirely in the enol form. The bromination, nitration, and sulfonation of this coumarin, and its coupling with diazotized amines, were all found to result in substitution at the 3 position. 3-Nitro-4-hydroxycoumarin could be reduced to the corresponding amino compound, and could be converted also into β -nitro-2-hydroxyacetophenone and into β -amino-2-hydroxyacetophenone.

VIII. *Phenylhydrazine degradation of 3,3'-methylenbis-(4-hydroxycoumarin)*, C. F. Huebner and K. P. Link (pp. 102-107).—The authors showed that the red compound $C_{20}H_{16}O_2N_2$ resulting from the action of phenylhydrazine on 3,3'-methylenbis-(4-hydroxycoumarin) is 1-phenyl-3-(*o*-hydroxyphenyl)-4-benzeneazo-5-pyrazolone.

1-Phenyl-3-(*o*-hydroxyphenyl)-4-benzeneazo-5-pyrazolone was synthesized by treating 2,3,4-triketochromane-3-phenylhydrazone with phenylhydrazine. An orange isomer which proved to be 1-phenyl-4-benzeneazo-5-(*o*-hydroxyphenyl)-3-pyrazolone also arises in this reaction. A product identical to the dimethyl ether of 1-phenyl-3-(*o*-hydroxyphenyl)-4-benzeneazo-5-pyrazolone was prepared from the progenitor having the pyrazolone ring, 1-phenyl-3-(*o*-methoxyphenyl)-5-pyrazolone by coupling with diazotized aniline. The resulting product was converted to the dimethyl ether by reaction with diazomethane. A product identical to the amine derivable by reduction from 1-phenyl-4-benzeneazo-5-(*o*-hydroxyphenyl)-3-pyrazolone was also synthesized from 1-phenyl-5-(*o*-methoxyphenyl)-3-pyrazolone. The amine, 1-phenyl-4-amino-5-(*o*-hydroxyphenyl)-3-pyrazolone, was prepared by nitrating 1-phenyl-5-(*o*-methoxyphenyl)-3-pyrazolone in the 4-position, reduction to the 4-amino product, and demethylation of the 4-amino product. A rationalization for the cleavage of 3,3'-methylenebis-(4-hydroxycoumarin) by phenylhydrazine is offered.

Brominated 4-hydroxycoumarins, C. F. HUEBNER and K. P. LINK. (Univ. Wis.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 4, p. 656).—The synthesis of bromine-containing anticoagulants related to the anticoagulant 3,3'-methylenebis-(4-hydroxycoumarin) is described. 3-Phenyl-4-hydroxy-6-bromocoumarin was prepared by an intramolecular Claisen condensation of methyl 2-phenylacetox-5-bromobenzoate. By the same type reaction, 4-hydroxy-6-bromocoumarin was prepared and by reaction with formaldehyde was converted to 3,3'-methylenebis-(4-hydroxy-6-bromocoumarin).

Polymerizable esters of lactic acid: α -Carbalkoxyethyl acrylates and methacrylates, C. E. REHBERG, M. B. DIXON, and C. H. FISHER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 2, pp. 208-210).— α -Carbalkoxyethyl acrylates and methacrylates were prepared by acylating methyl, ethyl, isopropyl, *n*-butyl, isobutyl, cyclohexyl, allyl, methallyl, and methylvinylcarbinyl lactates with acrylyl chloride, methacrylyl chloride, or methacrylic anhydride. Polymerization of these unsaturated esters yielded colorless and transparent resins. The esters having two olefinic linkages yielded insoluble and infusible polymers. The cross-linking tendency of the bifunctional monomers was less than that of methallyl acrylate but greater than that of citronellyl, furfuryl, or crotyl acrylate.

Pyrolysis of lactic acid derivatives: Production of phenyl and *o*-tolyl acrylate, E. M. FILACHIONE, J. H. LENGEL, and C. H. FISHER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 3, pp. 494-496).—The authors report the development of satisfactory methods for converting lactic acid into α -acetoxypropionyl chloride, phenyl α -acetoxypropionate, and *o*-tolyl α -acetoxypropionate. Pyrolysis of the phenyl and *o*-tolyl esters of acetoxypropionic acid yielded phenyl and *o*-tolyl acrylate, respectively. Styrene also was formed in the pyrolysis of phenyl acetoxypropionate. Relatively hard resins were obtained by polymerizing phenyl and *o*-tolyl acrylate.

A synthesis of the lactone of 2-methyl-3-hydroxy-4-carboxy-5-hydroxymethylpyridine, M. L. SCOTT, L. C. NORRIS, G. F. HEUSER, and W. F. BRUCE. (Cornell Univ.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 1, p. 157).—The authors outline a synthesis starting from 6-methyl-4-carbethoxy-3-cyano-2-pyridone, which they obtained by condensing cyanacetamide with ethyl acetylpyruvate.

Evidence indicating that the resulting compound possessed growth-promoting and antianemic properties is noted.

Fluorescence chromatography of the methyl glucoses, E. J. NORBERG, I. AUERBACH, and R. M. HIXON. Iowa Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 2, pp. 342-343).—The chromatographic method was applied directly to the methylated glucoses resulting from the hydrolysis of methylated starch, without resort to the formation of colored derivatives, by utilizing the fluorescence of the methyl celluloses under ultraviolet irradiation to permit following the separation visually.

When a solution of trimethyl and tetramethyl glucose in benzene was passed through an alumina column a single fluorescent band was formed. Upon further development with benzene, however, this separated into two bands, of which the lower consisted of tetramethyl glucose. These bands having been cut from the column, the methylated sugars could be recovered quantitatively by methanol extraction. Dimethyl glucose, being insoluble in benzene, was separated by passing through the column a solution of the three methylated sugars in equal volumes of acetone and benzene and developing with benzene. The dimethyl glucose was adsorbed as a fluorescent band, whereas the other two methylated sugars passed through unadsorbed.

Methyl 3-methyl-4,6-ethylidene- α - and β -glucosides, R. E. REEVES. (U. S. D. A.) (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 5, p. 845).—Catalytic deacetylation of a noncrystalline triacetate preparation gave a sirupy mixture of the two glucosides, which, after various treatments here described, was separated by fractional crystallization to yield small quantities of the crystalline α - (m. p. 106°–107° (cor.)) and β - (m. p. 133°–134°) glucosides. The respective specific rotations of the two compounds were $n_D^{25} = +114^\circ$ and -126° .

The separation and identification of the products of hydrolysis and alcoholysis of methylated disaccharides, G. H. COLEMAN, D. E. REES, R. L. SUNDBERG, and C. M. McCLOSKEY (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 3, pp. 381–386).—A new method for the separation of the hydrolysis products of completely methylated disaccharides, involving the introduction of azoyl (*p*-phenylazobenzoyl) groups into the positions opened by hydrolysis, is described. A similar method was based on the methyl alcoholysis of methylated disaccharides, followed by azoylation of one of the products. Both methods were applied to each of five completely methylated disaccharides. Crystalline azoyl derivatives of the 8 methyl trimethyl-D-glucopyranosides were obtained by chromatographic separation of the α and β mixtures.

Pyrolysis of nicotine to myosmine, C. F. WOODWARD, A. EISNER, and P. G. HAINES. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 6, pp. 911–914).—Ammonia, methylamine, hydrogen cyanide, pyridine, β -picoline, β -ethylpyridine, β -vinylpyridine, and 3,2'-nicotyrine were obtained in small quantities from the pyrolysis products of nicotine. Myosmine, a comparatively rare alkaloid, was obtained in fair yields by the pyrolysis of nicotine over quartz at 570° C. A new synthesis of β -ethylpyridine is described.

• **Nicotinic acid esters**, J. G. KAUFMAN. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 3, pp. 497–498).—The author describes a method for the preparation of methyl nicotinate in which quinoline is oxidized by heating for an hour with selenium and an excess of concentrated sulfuric acid, the reaction mixture is cooled, and the esterification is carried out by refluxing it for 6 hr. with methanol. After the esterification the reaction mixture was cooled with ice, made alkaline with ammonia, and extracted with ether. Vacuum distillation of the ether-free, dried product gave a yield of 60.2 percent of excellently crystallized ester, melting point 38° C. By proceeding in essentially the same way with ethanol in place of the methanol, the author obtained the ethyl ester in a yield of 55 percent. Esterifying with *n*-propanol, he secured 56.7 percent of the theoretical yield of *n*-propyl nicotinate. The same combination of oxidation and esterification was successfully applied to nicotine and to β -picoline, with the production of the same esters.

• **On the biogenesis of nornicotine and anabasine**, R. F. DAWSON (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 3, pp. 503–504).—The anabasine believed to have been found in grafts and hybrids of *Nicotiana glauca* and *N. tabacum* and in certain combinations of these with tomato scions was shown to be actually a mixture of anabasine with nornicotine, usually containing more nornicotine than anabasine.

"It is now clear that the replacement of the methyl group of nicotine in the plant leaf by the hydrogen atom of nornicotine accounts for the increase in secondary

amine content (previously attributed to anabasine) of such graft combinations and genetical hybrids. It follows that expectations of the development of hybrids between *N. tabacum* and *N. glauca* that would be suitable for the commercial extraction of anabasine are without justification."

The hydrolysis of pantothenate: A first order reaction. Relation to thiamin stability. D. V. FRÖST and F. C. MCINTIRE (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 3, pp. 425-427, illus. 2).—The authors found that hydrolysis of pantothenate in acid solution follows a first order relation with respect to pantothenate concentration. The activation energy of the reaction was measured to be 19,000 calories, corresponding to an increment per 10° C. of 2.6. The contrasting effect of acidity on rate of hydrolysis of thiamine and pantothenate is studied and discussed.

Viscosities of pectin solutions. H. S. OWENS, H. LOTZKAR, R. C. MERRILL, and M. PETERSON. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 7, pp. 1178-1182, illus. 4).—The relative viscosity of pectin solutions varied with the concentration in a manner similar to that of other ionizable hydrophilic colloids and certain salts. The viscosity of dilute pectin solutions increased to a maximum as the pH was adjusted to a value near 6. The viscosity could be reduced to a minimum value by the addition of acid or sodium chloride. As the concentration of pectin was increased above 0.5 percent, the relative viscosity was practically unaffected by changes in pH in the range of 1 to 7. Urea up to 0.5 molal concentration had little effect on the relative viscosity of pectin solutions. The relative viscosity-concentration curve followed the Arrhenius equation to a concentration of pectin of about 0.1 percent or more, depending upon the value for the intrinsic viscosity, when the solution was at a pH of 1 to 2 or when 0.9 percent or more of sodium chloride was present. This made it possible to calculate for the intrinsic viscosity values which may have some relation to the molecular weight. The viscosity-concentration curves for the pectinates of sodium, trimethylammonium, ethylenediammonium, 2,2-dihydroxymethylpropylammonium, and tetraethylammonium ions were practically identical. Changing the temperature from 0°-50° C. had little influence on the relative viscosity of pectin solutions at concentrations below 0.05 percent. Above that concentration the relative viscosity decreased with increase in temperature.

A tentative hypothesis which explains the results obtained is proposed.

The preparation of 1,3- and 1,4-pentadienes from furfural. L. E. SCHNIEFF and H. H. GELLER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 1, pp. 54-56).—The preparation of pure 1,3- and 1,4-pentadienes by pyrolysis of the diacetates of 1,2- and 1,5-pentanediols is described. Since these diols are obtained as hydrogenation products from furfural, this method provides a means of converting furfural to pentadienes. It was shown that the pyrolysis of these pentanediol diacetates proceeds through intermediate pentene-ol acetates. A new compound, pentene-1-ol-1 acetate, was isolated and characterized.

Epoxidation of unsaturated fatty materials with peracetic acid in glacial acetic acid solution. T. W. FINDLEY, D. SWERN, and J. T. SCANLAN. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 3, pp. 412-414).—The authors describe a procedure for the preparation of epoxy compounds in good yields from a wide variety of unsaturated fatty materials by oxidation under mild temperature conditions for short periods of time with peracetic acid in glacial acetic acid solution. Epoxidized oils, a new class of chemical reaction products from triglycerides, was prepared and isolated for the first time.

The reduction of peroxydisulfate by cerous ion, catalyzed by silver nitrate. W. H. CONE. (Univ. Idaho). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 1, p. 78).—The rate of reduction of peroxydisulfate ion by cerous ion was found to be directly proportional to the concentrations of the peroxydisulfate ion and the silver ion, but independent of the concentration of the cerous ion. The specific reaction rate was

approximately the same as that for the chromic ion, vanadyl ion, manganous ion, and hydrazine. The energy of activation was calculated.

Some derivatives of phenothiazine, H. GILMAN and D. A. SHIRLEY. (Iowa State Col.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 6, pp. 888-893).—Phenothiazine and some of its simple derivatives having shown a significantly low toxicity for animals, still further lowered by the introduction of substituents in the 10 (nitrogen-atom) position of a number of N-substituted phenothiazines of which the syntheses are here detailed, "only one had any activity [10-(4'- γ -diethylaminopropylamino)-phenyl-phenothiazine], and this was of a doubtful nature."

The liquid phase thermal isomerization of α -pinene, R. E. FUGITT and J. E. HAWKINS. (Univ. Fla.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 2, pp. 242-245, illus. 1).—A liquid-phase thermal isomerization of α -pinene at from 189.5° to 285° C. resulted in the formation of dipentene, α -pyronene, β -pyronene, and *allo*-ocimene and its dimer, identified in the reaction mixtures. It was found that dipentene and *allo*-ocimene are formed by simultaneous side reactions from the α -pinene, and that the *allo*-ocimene in turn yields β -pyronene, quite probably α -pyronene, and a dimer.

Structure of pyrodextrins, B. BRIMHALL. (Iowa Expt. Sta.). (*Indus. and Engin. Chem.*, 36 (1944), No. 1, pp. 72-75, illus. 3).—The author notes that pyrodextrins, defined as products of the degradation of starch by roasting, either alone or in the presence of small quantities of catalysts, are produced in hundreds of varieties by varying time of roasting, temperature, and catalyst. The properties of a commercial water-soluble pyrodextrin are shown to be in harmony with a molecule containing approximately 65 glucose residues arranged so that there are four or five short branches of approximately five glucose units each. The branched (amylopectin) and unbranched (amylose) components of cornstarch, as well as amylopectin, retrograded starch, and ordinary granular starch, were dextrinized and the course of conversion was followed by water solubility, reducing power, and the digestibility with β -amylase. The results indicate that the linear portions of starch become branched during the heating process as demonstrated by loss of ability to retrograde, increased resistance toward β -amylase, and percentage of tetramethylglucose upon hydrolysis of the methylated product. A possible mechanism for heat dextrinization is discussed.

Isolation of quercitrin and quercetin from goldenrod material, J. D. GUTHRIE, R. T. O'CONNOR, M. F. STANSBURY, and T. R. SAVICH. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 10, pp. 1794-1795).—Quercitrin (3,3',4',5,7-penta-hydroxyflavone-3-rhamnoside) and its aglucone, quercetin, were isolated from the acetone extractives of goldenrod, *Solidago leavenworthii*, T. and G. Since 15 to 20 percent of the dry goldenrod material, chiefly leaves, was soluble in acetone, a large quantity of material was available as a by-product from the acetone-benzene extraction process for obtaining rubber from goldenrod.

The kinetics of the antioxygenic synergism of quinones with ascorbic acid in fat systems, V. P. CALKINS and H. A. MATILL (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 2, pp. 239-242, illus. 4).—The absolute reaction rate of oxidation of ascorbic acid in ethyl esters of lard fatty acids was measured in the presence and absence of quinone. The synergism of quinone with ascorbic acid in the stabilization of these esters was shown to be due to the catalytic action of quinone. Quinone acted as a catalyst by being reduced to a semiquinone, which latter regenerated quinone by being oxidized by the activated peroxide radicals; this reduction of the peroxide radical prevented the accumulation of peroxides and thus protected the substrate. Quinone served as an intermediary agent in the ascorbic acid-ester system by lowering the free energy of formation of the activated complex to such an extent that it doubled the number of particles of ascorbic acid possessing sufficient energy of reaction. The results followed closely the views of Michaelis on compulsory

univalent oxidation, and on the basis of these data a mechanism for the synergistic action of quinone with ascorbic acid was proposed.

The isolation of stigmasterol and β -sitosterol from the common bean, *Phaseolus vulgaris*, A. C. OTT and C. D. BALL. (Mich. State Col.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 3, pp. 489-491).—The total unsaponifiable matter of the seed of *P. vulgaris* was found to be about 5.9 percent of the ether extract of the bean, or 0.15 percent of the air-dried bean. Of this unsaponifiable matter, about 60 percent consisted of crude sterols. Stigmasterol and β -sitosterol were isolated and characterized. The first-named compound formed about 25 percent, the second about 6 percent of the crude sterols. An unidentified sterol of high negative optical rotation was isolated. Certain other sterols were not found, though their presence in small quantities is considered not to have been precluded.

It was found that the unsaponifiable matter of the common bean after irradiation has a vitamin D activity of 700 U. S. P. units per gram.

Some experiments on the in vitro formation of thyroxine from diiodotyrosine, A. E. BARKDOLL and W. F. ROSS (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 6, pp. 898-899).—The yield of thyroxine from 2 weeks' slightly alkaline digestion of diiodotyrosine was not increased by oxidizing agents. Under oxygen-free conditions, however, no thyroxine was found. The yield of thyroxine was increased by passing carbon dioxide-free air through the solution during the incubation. Incubation in the presence of certain possible intermediates completely inhibited the formation of thyroxine.

Catalytic removal of hydrogen chloride from some substituted α -trichloroethanes, E. E. FLECK and H. L. HALLER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 12, p. 2095).—Anyhydrous ferric and aluminum chlorides, iron and its oxides, fuller's earth, and some other mineral substances were found to act catalytically to eliminate hydrogen chloride from certain α -trichloro- β -disubstituted ethanes to form the corresponding α -dichloro- β -disubstituted ethylenes. This catalytic action could be inhibited by some solvents but was promoted by others.

It is pointed out as a possibility that such a catalytic decomposition may be involved in the toxic action of the insecticidal α -trichloro- β -disubstituted ethanes. "This is indicated by the marked decrease in toxicity of the α -dichloro- β -disubstituted ethylenes."

A convenient synthesis of *dl*-tryptophan, H. R. SNYDER and C. W. SMITH. (Univ. Ill.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 3, pp. 350-351).—Gramine methiodide (3-dimethylaminomethylindole, readily prepared from indole, formaldehyde, and dimethylamine) was found to react smoothly with the sodium derivative of acetaminomalonic ester in the presence of dioxane. Ethyl α -acetamino- α -carbethoxy- β -(3-indole)-propionate was obtained in yields of 63-70 percent. Saponification converted the ester to the acid, and boiling a water suspension of the acid brought about decarboxylation. The resulting acetyltryptophan was converted to *dl*-tryptophan by alkaline hydrolysis. Two recrystallizations brought the product to analytical purity. The yield of *dl*-tryptophan, based on indole, was approximately 45 percent.

Xylitol esters of fatty acids, J. F. CARSON, JR. and W. D. MACLAY. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 9, pp. 1609-1610).—In connection with a study of plasticizers, the authors prepared xylitol by high-pressure, catalytic hydrogenation of D-xylose, and esterified this by reacting it with the anhydrides or chlorides of the corresponding acids to form pentapropionate, pentabutyrate, pentalaurate, pentamyristrate, pentapalmitate, and pentastearate. Xylitol pentapropionate and pentabutyrate were oily liquids with interesting possibilities as plasticizers for cellulose esters. The xylitol penta-esters of lauric, myristic, palmitic, and stearic acids are low-melting waxy solids.

A tensiometric method for evaluating surface wettability by measurement of the contact angle. H. WAKEHAM and E. L. SKAU. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 2, pp. 268-272, illus. 7).—A tensiometric method for the evaluation of surface wettability by measurement of the contact angle with an ordinary interfacial tensiometer is described. The contact angles corresponding to various tensiometer readings were determined experimentally, and were shown to be in agreement with those calculated from theoretical considerations. The application of the method to the measurement of contact angles of water on fabric and paper samples is illustrated, and the precautions and sources of error are discussed.

Métodos físicos y químicos de laboratorio, para el estudio de los suelos y de las tierras de cultivo [Laboratory methods for the study of physical and chemical properties of soils and cultivated lands], D. C. TAMÉS ALARCÓN (*Madrid: Inst. Nac. Invest. Agron.*, 1945, pp. 439+, about 35 illus.).

• **Color reactions for certain amino acids.** H. TAUBER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 2, p. 310).—The authors have observed that certain amino acids are converted to chromogens when heated. Alcoholic extracts containing these chromogens become more deeply colored when alkali is added, but on subsequent acidification become colorless or much lighter in color. Ten milligrams of the amino acid in a dry Pyrex test tube is heated over a burner until the first color change occurs, which may be to yellow or brown, depending on the amino acid. Overheating should be avoided since it destroys the chromogens. After cooling, 3 cc. of ethyl alcohol is added, the solution boiled for 30 sec., and the resulting solution divided equally among three small test tubes. To the first is added 0.2 cc. of 0.1 N sodium hydroxide, to the second 0.2 cc. of 0.1 N sulfuric acid, and to the third 0.2 cc. of water. The behavior of 21 amino acids [all found in protein hydrolysates] is described. The author notes that "these amino acids are not only compounds that react in this manner. We believe, however, that these observations are interesting enough to warrant recording. Especially remarkable is the strongly fluorescent compound that forms of the pyrolysis of phenylalanine."

A convenient microtitration method for the estimation of amino acids. A. E. SOBEL, A. HIRSCHMAN, and L. BESMAN (*Jour. Biol. Chem.* 161 (1945), No. 1, pp. 99-103).—The authors estimated the amino acid content of samples containing 50γ of amino acid nitrogen by means of a micromethod in which the α-amino nitrogen was split off with ninhydrin and determined as ammonia. The interference of ninhydrin with the liberation of ammonia was eliminated by the use of superoxol and subsequent aeration with concentrated KOH. All reactions were carried out in one vessel, from which the ammonia was finally aerated over into boric acid and titrated with standard acid, with a capillary micro burette. Quantitative results were obtained with 14 out of 18 of the amino acids tested. The method was rapid, and a large number of determinations could be carried out simultaneously.

Phosphorus compounds in animal tissues.—I, **Extraction and estimation of desoxypentose nucleic acid and of pentose nucleic acid.** W. C. SCHNEIDER. (Univ. Wis.) (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 293-303, illus. 2).—The author describes a new method consisting essentially in the heating of the tissue with 5 percent trichloroacetic acid after removal of phospholipids and acid-soluble phosphorus compounds. A variety of evidence indicating the quantitative nature of this extraction is given. Several nucleic acid samples, desoxyribose, ribose, and several desoxyribosides were tested and compared in their reactions with the diphenylamine, orcinol, and carbazole reagents. It was found that a single extraction with hot trichloroacetic acid would quantitatively remove nucleic acids from thymonucleohistone and from animal tissues. The effect of the trichloroacetic acid concentration and of the time of heating with trichloroacetic acid on the amounts of nucleic acids extracted from liver tissues was studied. The hot trichloroacetic acid extraction was combined with

known methods to produce a scheme for the separation of the phosphorus compounds of animal tissues into four groups: Acid-soluble, lipid, nucleic acid, and protein.

Contributions to the stereochemistry of γ -carotene, L. ZECHMEISTER and A. POLGÁR (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 1, pp. 108-112, illus. 4).—The *cis-trans* isomerization of γ -carotene, $C_{40}H_{56}$ (form of lower melting point, isolated from *Mimulus* and *Gazania* flowers) was studied by several methods, and configurations were tentatively assigned to some of the stereoisomers.

The fluorimetric estimation of vitamin B₁ in tablets and other pharmaceutical products, E. M. JAMES and F. WOKES (*Quart. Jour. Pharm. and Pharmacol.*, 18 (1945), No. 3, pp. 258-266, illus. 3).—The recommended fluorimetric method, based on that of Organ and Wokes (E. S. R., 93, p. 804), is described in detail as to technic and materials. Difficulties due to quenching of the fluorescence by various factors present in the types of materials studied are discussed, and ways of counteracting these sources of error are suggested.

Comparison of the English methods, which do not utilize any adsorption, with the official U. S. P. method, which uses an adsorbing agent, is being made. The authors note that with the latter procedure, under favorable conditions, fairly complete removal of the interfering quenching materials could be obtained.

A simple test for riboflavin in enriched flours, P. W. HOLDER and G. GARNATZ (*Cereal Chem.*, 22 (1945), No. 6, pp. 559-560).—The simplified test consists in making a water extract of the enriched flour to be tested—10 gm. of sample extracted 30 min. at room temperature with 100 cc. distilled water, shaking vigorously at 10 min. intervals. An aliquot is taken, and the extract is compared to standards prepared by treating flours of known riboflavin content (0.7 to 1.5 mg. per pound) in the same fashion. The different extracts and standards are compared visually in a dark room under strong ultraviolet light.

The authors conclude that "analysis of 39 samples by this method and our regular fluorometric procedure gave a correlation of $+0.90$ between the two methods. These tests were made over a period of several months and represent the work of three different operators. When operators have acquired some experience in applying the test, day-to-day reproducibility of the test is good and concordant results between operators are attainable."

Thiamine determination: Comparative study of yeast-growth, yeast-fermentation, and thiochrome methods, M. A. EPPRIGHT and R. J. WILLIAMS (*Indus. and Engin. Chem., Analyt. Ed.*, 16 (1944), No. 9, pp. 576-579).—A variety of substances was critically assayed by the yeast-growth method of Williams et al.,² the yeast-fermentation method of Schultz et al. (E. S. R., 88, p. 293), and the thiochrome procedure of Hennessy.³ The thiamine content was estimated on the following types of extracts: (1) Extracts of enzyme-digested (2 percent clarase plus 2 percent papain) samples; (2) extracts of alkali-digested (autoclaved at pH 9) samples; and (3) eluates of (1) and (2) prepared by adsorption of aliquots on Decalco, followed by elution with acidified KCl.

Modification of the original yeast-growth method was made using eluates prepared by method 3 above. This step eliminated certain high values found with some processed material (roasted peanuts, yeast extract, and rice bran concentrate), but was not successful with wheat products. Difficulties with the yeast-fermentation method were partially overcome by the use of excess H_2O_2 to remove residual sulfite in the sulfite-correction procedure. Low results, sometimes found in the thiochrome method, were thought to be due to the presence of certain substances interfering with the quantitative adsorption of the vitamin on Decalco. In the assay of alkali-treated materials, the yeast-fermentation method was found to give values several times

² Tex. Univ. Pub. 4137 (1941), pp. 31-35, illus. 1.

³ Cereal Chemists' Bul., 2 (1942), No. 2, pp. 25-29.

higher than those obtained by the thiochrome method. A discussion is given of the relative merits of each method, and a list of 24 references cited.

The microdetermination of iodine in biological materials with special reference to the combustion of samples in the Parr oxygen bomb, H. SPECTOR and T. S. HAMILTON. (Univ. Ill.) (*Jour. Biol. Chem.*, 161 (1945), No. 1, pp. 127-135).—A method for the determination of micro-quantities (less than 2 γ to about 15 γ) of iodine in biological materials is described, together with a modified method for liquid samples. In materials of high organic content, such as food, the sample was dried and ignited in the Parr oxygen bomb before digestion in acid permanganate. This method was successfully applied to samples ranging in size from 1 gm. of a solid sample to 1 l. of a liquid sample.

Colorimetric tests for DDT and related compounds, M. S. SCHAECHTER and H. L. HALLER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 12, pp. 2129-2130).—The authors report the discovery of a color reaction of compounds of the DDT type, the spectrophotometric curves of the colors formed from several such compounds indicating the feasibility of determining both the total and the relative quantities of 4,4'-dichlorodiphenyl-1-trichloroethane and of the corresponding 2,4'-compound. High extinction values were found, indicating a very good sensitivity as to be expected in the detection of DDT.

The colored compounds were obtained by polynitration of the compound or mixture to be tested, followed by treatment of the polynitro derivative in benzene solution with a solution of sodium methylate in methanol. The derivatives of p,p'-DDT and p,p'-DDD give blue colors with one absorption maximum and one minimum in the range studied, while the derivative of the ortho, para isomer of DDT gives a violet red color with two maxima and two minima.

Enzymatically synthesized crystalline sucrose, W. Z. HASSID, M. DOUDOROFF, and H. A. BARKER (Univ. Calif.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 8, pp. 1416-1419, illus. 3).—Synthetic, crystalline sucrose was obtained by the action of a sucrose phosphorylase from *Pseudomonas saccharophila* upon glucose-1-phosphate. The chemical constitution of the synthetic compound was shown to be identical with that of natural sucrose.

It is pointed out that "the de-phosphorolytic condensation of α -glucose-1-phosphate and fructose, resulting in the formation of sucrose, supports the conclusion that glucose exists in the sucrose molecule in the α -form."

White potato starches, P. E. MEISS, R. H. TREADWAY, and L. T. SMITH. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 2, pp. 159-163, illus. 8).—Conditions of paste formation required for making reproducible consistency measurements on domestic white potato starches are discussed. Several factors influencing the consistency of the paste, such as method of drying starch and the presence of water-soluble substances, were studied. Consistency data were interpreted to yield information regarding the extent of degradation and/or the amount of soluble material present in starch samples. Twenty-four samples of potato starch produced by factories in the United States during the 1941-42 season were examined by various chemical and physical tests. The consistency and particle-size measurements are discussed; the particle-size distribution of western potato starches is found to be different from that of Maine starches, but there was no relation between particle-size distribution and method of manufacture. Some conclusions concerning effects of manufacturing methods and the water used in them are stated.

Rubber content of native plants of the southwestern desert, T. F. BUEHRER and L. BENSON (*Arizona Sta. Tech. Bul.* 108 (1945), pp. 33-).—As a basis for this survey, the authors made a critical investigation of the methods for determining the rubber content of plant material. For the extraction method, the best conditions were found to be those of a continuous extraction of not less than 13 hours' duration.

The accuracy of the extraction with benzene was found to be less than that with acetone, a condition arising from the fact that rubber forms a benzogel which goes into solution rather slowly and diffuses slowly out of densely fibrous material, even when ground fine. Because of the formation of a benzogel, the intermittent extraction procedure was not satisfactory with benzene, and the results were found likely to be too low unless the extraction is continued for 13 to 16 hr. When the order of extraction with acetone and benzene was reversed, a considerable portion of the acetone-soluble resins and waxes were also found to be soluble in benzene, often in quantities as high as 10 percent. Hence, if the acetone extraction happens to be incomplete, the value for the percentage of benzene extract will be too high and thus will yield a misleading result for the quantity of rubber present in the sample. It was found, however, that these treatments did not increase the quantity of rubber extracted, the percentage being in most instances either equal to or less than that extracted from the original material. In trials of the bromination method, a very close agreement between the quantity of rubber substance so determined and the quantity of benzene extract corresponding to it was observed in most instances. When a sample of pure deproteinized rubber was used, the factor for calculating rubber hydrocarbon from the tetrabromide precipitate obtained was 0.2937 as compared with 0.2986 for the ratio of pure isoprene to isoprene tetrabromide. The factor so determined was used in all calculations. It is concluded that the percentage of benzene extract is a sufficiently trustworthy indication of the amount of true rubber substance in a sample.

Most of the plants showed a rubber content far below such a percentage as is considered adequate to constitute them a commercial source of rubber. One hundred and twenty-two of them contained less than 1 percent of rubber. Among those taken from their native habitat which contained about 2 percent of rubber were: *Amsomia hirtella*, *Asclepias albicans*, *A. erosa*, *A. latifolia*, *A. subulata*, *Funastrum cynanchoides*, *Garrya wrightii*, *Guardiola platyphylla*, *Solidago canadensis arizonica*, and *Tecoma stans angustatum*. The species grown under irrigation which contained over 2 percent were as follows: *A. curassavica*, *A. erosa*, *A. speciosa*, *Cryptostegia grandiflora*, *Cynanchum* sp., *Parthenium argentatum*, *Periploca graeca*, and *Scorzonera tausaghyz*. It is pointed out that this indicates that the conditions of climate and of soil under which the plant is growing are less important factors in determining its rubber content than the specific characteristics of the plant genus and the age or stage of development of the plant at the time of analysis. A statistical study of the data for the acetone and benzene extracts of a variety of plants, grown in their native habitat and under irrigation, showed that no significant correlation exists between the percentages of these groups of constituents.

Chemical investigations in guayule.—I, Essential oil of guayule, *Parthenium argentatum* Gray, A. J. HAAGEN-SMIT and R. SIU. (U. S. D. A. et al.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 12, pp. 2068-2074, illus. 2).—The essential oil of the guayule plant (*P. argentatum*) was investigated with regard to its chemical and physical properties, its composition, and its distribution in the plant.

On the basis of the fresh weight, the leaves had the highest essential oil content (1.04 percent), followed by the flowers (0.75 percent), the bark (0.24 percent), and the wood (0.11 percent). The average yield from the entire plant was 0.45 percent.

By distillation into 45 fractions, the oil was divided into five main groups comprising terpenes (72.6 percent), oxygenated terpenes (5.8 percent), sesquiterpenes (9.3 percent), oxygenated sesquiterpenes (6.3 percent), and a residue of 5.9 percent. Of individual compounds the following were identified and their percentages were determined: 60 percent α -pinene; 9 percent dipentene; 8 percent cadinene; 6 percent di-, tri- and higher terpenaceous compounds; 4 percent elemol-like sesquiterpene alcohol; 4 percent phellandral (probably); 3 percent sesquiterpene alcohol with an α

zulene nucleus; 2 percent guajene-like sesquiterpene; 2 percent terpene ketone or aldehyde; 2 percent β -pinene; and small amounts of an easily oxidizable terpene. The significance of these compounds in relation to the formation of rubber in the plant was discussed.

Inulin in guayule, *Parthenium argentatum* Gray, W. Z. HASSID, W. L. MCRARY, W. H. DORE, and R. M. MCREADY. (Univ. Calif. coop. U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 11, pp. 1970-1972).—The authors investigated the structure and properties of a fructosan isolated from *P. argentatum*, finding that methylation and hydrolysis of this polysaccharide yielded principally 3,4,6-trimethylfructofuranose, a result showing that the fructose units are combined in the fructosan through the positions 1 and 2. Data obtained from an oxidation of the fructosan with sodium periodate showed the fructose units to have furanose configuration. The X-ray diffraction pattern of the guayule polysaccharide was found to be identical with that of inulin, a fact further implying the identity of the fructosan from guayule with inulin.

Isolation of partheniol, parthenyl cinnamate, and other constituents from guayule resin, E. D. WALTER. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 3, pp. 419-421, illus. 2).—Partheniol, a new sesquiterpene alcohol, and parthenyl cinnamate were isolated from guayule resin, and some of their properties, including crystallographic optical properties, are described. A crystalline waxlike substance and several fractions of volatile oils, probably sesquiterpenes, were prepared from acetone extracts of whole shrub, guayule foliage, and guayule rubber. Retting of the shrub appears to make no change in the relative proportions of the constituents isolated from the resin.

An orange-colored pigment of cottonseed, C. H. BOATNER, M. CARAVELLA, and C. S. SAMUELS. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 66 (1944), No. 5, pp. 838-839).—The authors isolated an orange-colored pigment from an ether extract of cottonseed. The extract was reextracted with a dilute aqueous solution of sodium hydroxide containing sodium dithionite ($\text{Na}_2\text{S}_2\text{O}_4$). The yellow-colored ethereal layer which separated from the aqueous extract, when it was exactly neutralized with concentrated hydrochloric acid, was withdrawn. Addition of an equal volume of glacial acetic acid to the ethereal solution caused the rapid precipitation of gossypol "acetate." When the filtrate was allowed to stand for about a week, and orange-colored solid slowly precipitated. This solid was extracted with hot acetone from which orange-colored crystals precipitated on cooling. The product was recrystallized first from hot acetone and finally from a mixture of hot chloroform and ether.

The new pigment was found less soluble than gossypol in most organic solvents. It melted at 212° (cor.) to form a more deeply colored solid, which melted with decomposition at 238° - 239° . It was insoluble in alkali. It did not form a precipitate with aniline, reduce Fehling solution, or give a positive fuchsin-aldehyde test. The orange-colored pigment reacted with hydroxylamine and with dinitrophenylhydrazine, but the products differed in melting point from the corresponding products obtained with gossypol. Absorption spectra of the new pigment (including a well-defined maximum at 435 m μ) and of an unstable antimony trichloride derivative (maximum at 450-460 m μ) differed from those of gossypol, but a chloroform solution treated with hydrochloric acid and then with antimony trichloride produced an absorption spectrum the same as that given by gossypol under like treatment. This is held to indicate conversion of the new pigment into gossypol by hydrochloric acid.

Alcohol from agricultural commodities, P. B. JACOBS (U. S. Dept. Agr., Bur. Agr. and Indus. Chem., 1945, AIC-95, pp. 77+).—This report, one of a number forming a part of the work under the postwar planning project Post-War Readjustments in Processing and Marketing Facilities and Methods, assembles data on the industrial and beverage alcohol industries as possible outlets for agricultural products

and wastes under the following main headings: Production and consumption of industrial alcohol; organization of the distillation industries; alcohol production capacities; foreign alcohol situation; alcohol from agricultural products; sources of alcohol; financial aspects; present status of methods for producing alcohol from agricultural products; possible postwar situation in the alcohol industry; alcohol for synthetic rubber production; alcohol for use in motor fuel; and alcohol from waste products of the farm. An appendix assembles numerous statistical data in tabular form.

Nutrient content of alcohol fermentation by-products from corn, J. C. BAUERNFEIND, J. C. GAREY, W. BAUMGARTEN, L. STONE, and C. S. BORUFF (*Indus. and Engin. Chem.*, 36 (1944), No. 1, pp. 76-78, illus. 1).—The authors give data on the vitamin, mineral, and amino acid content of corn distillers' byproducts which should be of value in the feeding of the byproducts to livestock. Corn distillers' dried solubles can serve as a valuable source of the water-soluble vitamins and as such would have practical merit in the rations of simple-stomached animals. Corn distillers' grains (no solubles), a product of low water-soluble vitamin and high fiber content, would be best utilized in the rations of ruminants as a source of fat, protein, and energy. Corn distillers' grains with solubles were found to possess a higher vitamin content, although a similar chemical composition, when compared to the above grains, which would make this byproduct an acceptable ingredient in the rations of both groups of livestock.

Preparation of poultry feed from garbage (*Hawaii Sta. Bien. Rpt. 1943-44*, pp. 58-59).—An increase in the Oahu population such that hog raisers are no longer able to utilize all the garbage, together with the almost complete dependence of the Hawaii poultry industry upon imported feeds, led to an examination of the garbage as a source of poultry feed. On the basis of the oven-dried material, the average composition, August 1942 to May 1943, was: Protein, 23.5 percent; fat, 28.6; fiber, 2.0; ash, 5.8; and nonnitrogenous substances, 40.0 percent. The fresh material contained from 65 to 85 percent water, which was removed by combined air- and artificial drying. Solvent extraction with a specified commercial "thinner" removed about 90 percent of the fat content. These operations yielded (1) a cream-colored, friable, odorless meal of good keeping qualities which when properly supplemented proved a satisfactory feed for poultry, and (2) marketable fats and oils. Several hundred pounds of these products were prepared by means of a small, improvised pilot plant. A high degree of solvent recovery from the extracted fats and oils as well as from the degreased garbage was effected in the laboratory.

Peptization of nitrogenous constituents of solvent-extracted peanut meal, T. D. FONTAINE and R. S. BURNETT. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 2, pp. 164-167, illus. 4).—A total of more than 80 percent of the nitrogenous constituents in solvent-extracted peanut meal was peptized upon the addition of water (pH 6.6). Minimum peptization occurred in the pH range 3.5 to 5. More than 80 percent of the total meal nitrogen was peptized at pH 1.5, and more than 90 percent at pH 7.2 and above. Calcium, barium, and magnesium chlorides (0.25 to 1.0 N) were effective peptizing agents at pH values between 5 and 6. At lower concentrations they decreased the amount of nitrogen peptized in the pH range 6 to 9. Sodium and potassium salts in general (except fluorides and acetates) were good peptizing agents at 1.0 N concentration. The 27 salts investigated appeared to offer no advantage over weak alkali (pH 7.2) as to the amount of nitrogenous constituents peptized. The importance of considering pH as well as salt concentration in evaluating peptizing agents for the nitrogenous constituents of peanut meal is emphasized.

Continuous process for solvent extraction of tung oil, R. S. MCKINNEY, W. G. ROSE, and A. B. KENNEDY ET AL. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 2, pp. 138-144, illus. 10).—The best preparation of tung kernels and

seeds for extraction by a continuous process with n-hexane was obtained with roller mills, but no special preparation was needed for tung press cake. Extraction efficiencies of 99 percent or better were obtained with ground tung kernels, seeds, commercial press cake, and an experimentally prepared tung press cake containing 20 percent oil. Solvent-extracted oils from the first experiments contained excess acidity and tended to solidify but were rendered permanently liquid by a mild heat treatment. Extracted oils of low acidity, satisfactory quality, and liquid at ice box temperature were obtained by extracting tung material shortly after preparation and by filtering the miscella. These oils were formulated into varnishes and tested for durability. The tests indicated that these oils could be used by the paint and varnish industry, although oil from tung press cake was somewhat lower in quality than that of expressed tung oil and the varnish prepared from it appeared inferior to the standard spar varnish in durability.

Catalytic vapor-phase oxidation of fatty oils, W. L. FAITH and E. J. ROLLINS. (Kans. State Col.) (*Indus. and Engin. Chem.*, 36 (1944), No. 1, pp. 91-92, illus. 2).—The authors note that the combined thermal decomposition and catalytic vaporphase oxidation of fatty oils in a one-step process presents many technical difficulties which prevent high conversions. The optimum conversion of red oil to maleic acid was 24.2 mole percent at 425° C. and a space velocity of 28 reciprocal hours. The glycerides (sardine and soybean oils) gave much smaller conversions and caused considerable fouling of the catalyst because of premature ignition. These results indicate that, to obtain maximum conversion of maleic anhydride from unsaturated acids, the acid should be capable of vaporization without appreciable decomposition. The glycerides are even less suitable for this reaction than the acids themselves.

Racemic menthol, new synthesis from thymol, A. L. BARNEY and H. B. HASS. (Purdue Univ.). (*Indus. and Engin. Chem.*, 36 (1944), No. 1, pp. 85-87, illus. 2).—The desired products are separated in each of two steps by precision vacuum rectification. The use of a dehydrogenation catalyst in conjunction with a 60-plate column allows the complete conversion of all the hydrogenation products of thymol to *dl*-methone, which can then be catalytically reduced to give a good conversion to *dl*-menthol. All byproducts obtained may be recycled, and the *dl*-menthol produced is indistinguishable in taste and odor from pure *l*-menthol.

AGRICULTURAL METEOROLOGY

Descriptive meterology, H. C. WILLETT (*New York: Academic Press, 1944, pp. 310+*, illus. 55).—This textbook is intended for third or fourth year college students and is designed to give a first comprehensive introduction to the subject, including a basic understanding of the weather processes as they are observed in the atmosphere. Emphasis is placed on the organization and continuity of the presentation of the subject matter rather than on completeness.

Sobre la interpolacion y reduccion de series climatologicas [The interpolation and reduction of climatological series], O. SCHNEIDER (*An. Soc. Cien. Argentina*, 140 (1945), No. 4, pp. 257-302, illus. 10; *Eng. abs.*, p. 257).—Climatological series from stations with partly missing records sometimes need to be completed by interpolation; after summarizing the general statistical principles on which this technic is based, the condition of homogeneity is examined and some methods for testing it are discussed. Three kinds of homogeneity are distinguished: (1) Self-consistency of the record of an individual station, which may be tested by comparison with a neighboring observatory; (2) statistical constancy ("quasi-homogeneity") in a system or network of stations, each of which is self-consistent, though systematic differences not due to climatological causes may exist (e. g., errors in the exposure

of instruments); and (3) absolute homogeneity in a network of stations, requiring as a necessary condition the existence, at least, of quasi-homogeneity. Only the last is correct from the standpoint of general climatology, though the first two may serve for interpolation purposes. Some of the more common methods of interpolation are illustrated with examples from temperature and rainfall records by Argentine meteorological stations. In the last chapter the ideas of various authors concerning the admissible limits of range for the auxiliary stations are summarized. It is especially important to remember that only stations with similar climatic conditions and exposure ought to be compared. Moreover, no constant of reduction (coefficient or additive term) should be used for interpolation of other months or seasons than those for which it had been obtained. There are 36 references.

The field of vertical motion in selected weather situations, R. G. FLEAGLE (*Amer. Geophys. Union Trans.*, 26 (1945), No. 3, pp. 359-366, illus. 6).—The effect of vertical motion on pressure and temperature changes is briefly discussed, and the role of vertical velocities in the condensation process is stressed. Two independent methods for measuring vertical velocities are outlined, and a practical technic for computation is described. The effect of vertical velocities in bringing about changes in sky condition and weather is illustrated by two cases. The field of vertical velocity from the surface to 13 km. through a Colorado low is illustrated by a cross section showing in the vertical plane the projections of streamlines of air flow, pressure changes, type of temperature advection, and the locations of the tropopause and the trough line.

Correlations of solar variation with Washington weather, C. G. ABBOT (*Amer. Geophys. Union Trans.*, 26 (1945), No. 3, pp. 367-378, illus. 6).—This contribution to the subject (E. S. R., 76, p. 5) offers further data and discussions on temperature and precipitation in relation to solar activity, and on the prediction of temperatures. It is believed from the comparisons presented that approximate predictions a week in advance could be made of peaks and troughs of Washington, D. C., temperature if daily reports could be had on the "critical frequency" in ionization layers of the atmosphere from a sufficient number of stations and if means could be found to anticipate by a few days a close approximation of the date of the next approaching solar change. It is believed to be a fair hope that such important dates as heavy frosts may become predictable a week in advance from solar observations. The paper is discussed by J. B. Kincer.

A blueprint sunshine recorder for Hawaii's plantations, R. J. BORDEN, L. R. SMITH, and S. KOBORI (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 49 (1945), No. 3-4, pp. 245-250, illus. 4).—The instrument described and illustrated consists of two half-cylinder and duplicate receptacles firmly joined together and mounted under cover in such a way that the whole unit can be moved along two parallel rods. A small sheet of ordinary blueprint paper—sensitive side up—is laid flat along the concave surface in each receptacle to receive the sun's rays through a pinhole in the cover. As the sun moves through the sky its rays enter this small hole and cause a photographic exposure in the form of a visible line when the paper is developed; cloud obstructions immediately break the line. The new instrument cannot take the place of an expensive pyrliometer, but it has proved quite positive in its ability to record the duration of the sunshine in terms of hours and fractions of hours; it provides a simple device for measuring the duration of sunshine, which undoubtedly has an important effect on sugar yields.

The 22-year solar pattern of rainfall in Oklahoma and Kansas, C. J. BOLLINGER (*Amer. Met. Soc. Bul.*, 26 (1945), No. 9, pp. 376-383, illus. 2).—It is concluded from this study that the climate of these two States during the period of reliable meteorological record—1886-1944—has exhibited a 22-yr. cycle of solar pattern. The recurrent series of wet and dry, "good" and "poor" crop years are not—as thought

by some—purely fortuitous or terrestrial but are mainly solar in origin, cyclic in character, and hence roughly predictable.

Meteorology of the mid-West floods of May, 1943, J. VEDERMAN (*Amer. Met. Soc. Bul.*, 26 (1945), No. 8, pp. 317–330, illus. 23).—An analysis of the storms and floods, with the forecasts and their verification.

The ice clearing dates of the Maine Lakes, C. B. FOBES (*Amer. Met. Soc. Bul.*, 26 (1945), No. 8, pp. 331–333, illus. 1).—A map shows isolines of the mean dates at which Maine lakes clear of ice.

Note on tropical storm north of Puerto Rico on September 13, 1945, H. RIEHL (*Amer. Met. Soc. Bul.*, 26 (1945), No. 9, pp. 357–360, illus. 1).—Note on the severe hurricane which struck Florida on September 15–16, 1945, and which passed a short distance north of Puerto Rico on September 13.

The nocturnal maximum occurrence of thunderstorms in the Midwestern States, L. L. MEANS (*Univ. Chicago, Dept. Met., Misc. Rpts. No. 16 (1944), pp. 38+*, illus. 29).—A nocturnal maximum occurrence of thunderstorms is found in certain geographical regions; data for Omaha, Nebr., showed that the month of maximum occurrence of nocturnal thunderstorms falls later in the year than that for the daytime thunderstorms, July–August being important for the nocturnal ones. The average duration of nocturnal thunderstorms at Omaha is greater than that for the daytime storms. Factors causally related to the nocturnal maximum should have a similar geographical distribution, show a diurnal variation with a nocturnal maximum in the region of that for the nocturnal thunderstorms, and be sufficiently persistent to be consistent with the longer average duration of such storms. In the study of individual occurrences at Omaha for 1941, using radiosonde data and hodograph analysis of pilot-balloon data, the principal factor contributing to instability for the formation of thunderstorms proved to be advection of warmer air in the lower layers of the atmosphere; thunderstorms occurring with advective warming in these lower layers occurred both day and night but were most frequently nocturnal. Data for the 1,500-m. level showed a geographical area of maximum occurrence of apparently warm-air advection corresponding to the general region of nocturnal maximum occurrence of thunderstorms, while at the 3,000-m. level the warm-air advective component was less. The diurnal wind variations for summer showed stronger winds at night for the 750- to 2,000-m. levels. These winds had an average direction from regions which in the mean were warmer. Mean temperature gradients for these levels exhibited small variations from day to night in the Midwest, with possibly slightly greater temperature gradients occurring at night. Instances were found where persistent advection of warmer air in the lower layers contributed to the maintenance of instability and thunderstorm activity at Omaha for over 4 hr. at a time. These findings thus appear to indicate that the advection of warmer air in the lower layers of the atmosphere is a consistent factor as related to the nocturnal maximum occurrence of thunderstorms in the Midwest.

A brief note on dust storms and their causes, B. A. KEITH (*Amer. Met. Soc. Bul.*, 26 (1945), No. 8, pp. 338–339).

The relationship between sea-level and 10,000-foot zonal westerlies, H. L. WYNN (*Amer. Met. Soc. Bul.*, 26 (1945), No. 9, p. 334).—A note.

Waves in the easterlies and the polar front in the Tropics, H. RIEHL. (Univ. P. R.). (*Univ. Chicago, Dept. Met., Misc. Rpts. No. 17 (1945), pp. 79+*, illus. 47).—This report on research conducted at Rio Piedras, P. R., is discussed under the four sections: Waves in the easterlies (the undisturbed tropical current, definition of “waves in the easterlies”, model of a well-developed wave, kinematics of waves in the easterlies, principles of synoptic analysis, forecasting methods, and suggestions on the origin of the waves); the polar front in the Tropics (separation of the polar trough, comparison between the polar trough and waves in the easterlies, the cold

front, the induced trough, principles of synoptic analysis, and forecasting methods); the relation of the structure of the subtropical highs to wave motion in the Tropics (the slope of the subtropical highs with elevation and the effect of the meridional temperature gradient, the significance of regional zonal indices for forecasting in the Tropics, and the formation of maritime tropical air); and tropical storms in winter. There are 29 references.

The development of a new wind-measuring system, L. E. WOOD (*Amer. Met. Soc. Bul.*, 26 (1945), No. 9, pp. 361-370, illus. 7).—The author describes a new light-weight anemometer and wind vane, with associated equipment. The characteristics of pitot static, bridled, cup wheel, and propeller anemometers are discussed, and reasons are given for using a propeller in the new equipment. The propeller type is characterized by accuracy, linearity, and generally excellent performance as determined by wind tunnel and other tests. It is adaptable to wind speed measurement by means of magneto and voltmeter, disk and roller tachometer mechanism, contacts, or electronic devices. Though primarily designed for fixed station and marine use, the equipment is suitable where portability is required.

A test circuit for wind indicators, R. L. IVES (*Amer. Met. Soc. Bul.*, 26 (1945), No. 9, pp. 385-386, illus. 1).—A note.

A generalization of the thermal wind equation to arbitrary horizontal flow, G. E. FORSYTHE (*Amer. Met. Soc. Bul.*, 26 (1945), No. 9, pp. 371-375, illus. 1).—"The purpose of the present note is to derive a formula for the shear of the actual wind, assuming horizontal flow of the air in the absence of frictional forces, and to show how the direction and spacing of the virtual-temperature isotherms can be obtained from this shear. A method of drawing a sketch . . . is given which can be used qualitatively to examine all possible cases of gradient wind shear."

A contrast in seasonal effects, R. J. B[ORDEN] (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 49 (1945), No. 3-4, p. 243, illus. 1).—An illustrated note showing the contrast in seasonal effects on the growth of 32-8560 plant sugarcane at Makiki.

SOILS—FERTILIZERS

The soil: An introduction to the scientific study of the growth of crops, A. D. HALL and G. W. ROBINSON (*London: John Murray, 1945, 5 ed., rev., pp. 322+*, illus. 23).—The fifth edition of the text (E. S. R., 66, p. 810), which was first published in 1903. Several of the chapters have been rather completely changed or replaced, while some chapters have been altered only slightly.

Dynamik der Deutschen acker- und waldböden [Dynamics of German cultivated and forest soils], W. LAATSCH (*Dresden and Leipzig: Theodor Steinkopff, 1944, 2 ed., pp. 289+*, illus. 72).—A technical presentation of important physical and chemical properties. Considerable attention is given to the clay mineral fraction.

Simple kinetic theory of ionic exchange for ions of unequal charge, L. E. DAVIS. (Univ. Calif.). (*Jour. Phys. Chem.*, 49 (1945), No. 5, pp. 473-479).—The kinetic ionic exchange theories of Vageler and Woltersdorf and of Gapon, and the oscillation volume theory of Jenny (E. S. R., 78, p. 440) are discussed. The oscillation volume theory is extended to the case of ions of unequal charge and a simple approximate equation is derived. It is shown that this theory implies that ionic exchange is a complex ionic redistribution in the colloidal suspension. The redistribution exchange cannot be described rigorously by simple mass-action expressions. The simplified equations presented are approximations having considerable utility in "favorable" cases.

Effect of type of soil colloid on cation-adsorption capacity and on exchangeable hydrogen and calcium as measured by different methods, A. MEHLICH.

(N. C. Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 4, pp. 289-304, illus. 4).—Soils and minerals representing the organic, hydrous mica, and the 2 : 1 and 1 : 1 lattice type of colloids were used in a comparison of equilibration and NH_4OH volatilization methods for determining the saturation point; a comparison of the CO_2 equilibrium, NH_4OH , NH_4OAc , BaOAc , and BaCl_2 —triethanolamine methods for determining the cation-adsorption capacity and degree of saturation as influenced by the type of colloid; and a comparison of the relative efficiency of the NH_4 and Ba ions in replacing exchangeable Ca in the presence and absence of CaCO_3 .

The saturation point of the mineral colloid was very satisfactorily obtained by both the CO_2 equilibration and the NH_4OH volatilization methods. With organic soils, the NH_4OH method yielded values that were somewhat lower and less constant than those obtained with the equilibration procedure. With colloids of the hydrous mica and the 2 : 1 lattice type, the cation-adsorption capacity was virtually the same with all the methods studied. The NH_4OAc method yielded lower values with colloids of the organic and the 1 : 1 lattice type than those obtained by the other methods. An organic soil at first saturated with Ca contained greater quantities of H after treatment with NH_4OAc . More NH_4 ions remain adsorbed from NH_4OH than from NH_4OAc . Adsorption of Ba from BaOAc was greater in the presence of CaCO_3 in all cases. The saturation deficit in relation to pH and expressed as percentage saturation was virtually the same with all methods in the case of the hydrous mica and 2 : 1 type of colloids. With colloids of the 1 : 1 lattice type and the organic soils the degree of saturation was consistently higher when determined by the NH_4OAc method. The efficiency of the Ba and NH_4 ions in replacing Ca was about the same for the mineral colloids; it was appreciably less with NH_4 , however, for the organic soils. Almost all the freshly precipitated CaCO_3 present in the various systems above pH 8 was soluble in 1 N NH_4OAc but was only slightly soluble in 0.2 N BaOAc and 0.2 N BaCl_2 —triethanolamine.

Some of the errors arising from the presence of carbonates are discussed. It is concluded that a method employing a divalent cation buffered at about pH 8 is best adapted for the evaluation of the cation-exchange status of groups of soils with a variety of types of colloidal material.

Hydrogen-ion concentration of the important soils of the United States in relation to other profile characteristics, III-IV, E. H. BAILEY. (U. S. D. A.). (*Soil Sci.*, 60 (1945), Nos. 3, pp. 241-262; 4, pp. 321-332).—A continuation of a study which has already covered Pedocals, Pedalfers, and soils transitional between these groups (E. S. R., 93, p. 543).

III. Intrazonal soils (pp. 241-262).—The sola of the Solonchaks were found the most alkaline among the profiles studied, ranging from neutral to very strongly alkaline. This group appeared to have no uniformity as to the location in the profile of the most and the least alkaline horizons. The Solonetz sola varied from strongly acid to strongly alkaline, most of them showing in the dense columnar horizons a pH value higher than that found in the surface horizons. Two-thirds of the Solonetz profiles were found more alkaline in the compact than in the C horizons. Of the Meadow soils (Wiesenböden), the sola examined varied from moderately acid to strongly alkaline, the pH value increasing with the depth. The profiles of the Half Bog soils in regions where soils were high in lime and where the parent material was also high in lime varied from slightly acid to strongly alkaline. The profiles of the Half Bog soils in regions where soils were low in bases and where the parent material was also low in bases ranged from extremely acid to very strongly acid. The profiles of the Half Bog soils formed on parent material high in lime had a general tendency to become more alkaline with depth, whereas the soils from regions low in bases tended to have the same pH throughout the profile. The ground-water Podzols ranged from extremely acid to strongly acid in their sola. They were the

most acid in the A_1 and B horizons. The Planosol reactions were found in general very similar to those of the associated zonal soils. In the podzolic regions, however, the Planosols were often slightly more acid than the corresponding zonal soils; in the Chernozem zone, more acid in the horizons above the lime than were the normal Chernozems; and in the reddish Chestnut soil region, more alkaline in the horizons above the lime than were the normal reddish Chestnut profiles. Among the calcimorphic soils (represented by the Rendzina soils), the sola were from moderately to strongly alkaline. These sola appeared to have a tendency toward alkaline reaction throughout.

IV. *Azonal soils* (pp. 321–332).—Of these soils, paper 4 takes up lithosols and alluvial soils. Summarized in tabular form are the color, morphology, and pH values of layers from various depths of lithosols from New York, Pennsylvania, West Virginia, Virginia, Ohio, Alabama, Idaho, and Washington. Like characteristics of alluvial soils from various of the Central, Southern, and Western States are dealt with similarly. The significance of the numerous data are briefly discussed. In general, the variations from surface soil to layers at considerable depth appears less than those shown by soils of the groups previously studied. The pH values of the lithosols and alluvial soils as a whole show a wide range, however, their pH values appearing to be most nearly related to those of the respective parent materials.

The pedography of hydrologic Podzol [soil] series, I–VI (*Lantbr. Högsk. Ann. [Uppsala]*, 7 (1939), pp. 185–227, illus. 11; 8 (1940), pp. 183–207, illus. 7; 9 (1941), pp. 222–238, illus. 10; 11 (1943), pp. 172–189, illus. 14; 12 (1944–45), pp. 119–129, illus. 6; 186–203, illus. 1).—This series of papers deals with the effect of water on the soil forming process.

I. *Loss on ignition, pH, and amphoteric reactions*, S. Mattson and H. Lönnemark (pp. 185–227).—One hundred and ninety samples from a hydrologic series of 15 Podzol profiles have been studied with respect to the loss on ignition, the pH, and the amphoteric reactions.

II. *The loss on ignition and the reaction of the Annerstad series*, H. Lönnemark, L. Wiklander, and S. Mattson (pp. 183–207).—The Annerstad series is located near the south end of Lake Bolmen in the province of Småland in southern Sweden. Results are reported from 12 profiles comprising 151 samples, which included 17 species of plants and 5 samples of litter. Data are presented on the loss on ignition and the pH of the samples. The Annerstad series differs from the Uden series reported above, in that it is podzolized and possesses a bleached A_2 horizon deep under the water table and below a 140-cm. layer of peat.

III. *Loss on ignition and pH of the Dala Brown earth series*, H. Larsen and S. Mattson (pp. 222–238).—The profile series was obtained in the Valley of Dala on an eastern slope of a terrace next to a steep hill which forms part of the Hallandsås ridge in southern Sweden. Data are presented on mechanical analysis, loss on ignition, pH, and the exchange capacity.

IV. *The distribution of Si, Al, Fe, Ti, Mn, Ca, and Mg in the Uden Podzol and the Dala Brown earth series*, B. Bengtsson, N. Karlsson, and S. Mattson (pp. 172–189).— β acids are soluble in acids precipitated by salts of aluminum or iron and have a high banding capacity for bases, simple organic acids, and carbon dioxide. Distribution of Al, Fe, Si, Ti, and Mn was determined by the Tamm acid oxalate method and the exchangeable Ca and Mg by displacement with ammonium chloride solution in the Uden Podzol and the Dala Brown earth hydrologic series of soil profiles. The results are shown in the form of pedographic series.

V. *The distribution of K and P and the Ca : K ratios in relation to the Donnan equilibrium*, S. Mattson (pp. 119–129).—The acid lactate-soluble phosphoric acid and the chloracetic acid-soluble potassium were determined in the Uden Podzol series and in the Dala Brown earth series. The results are presented in the form

of pedographic charts. The Ca : K ratio has been found to vary with the saturation of the soil and with the strength of the acidoids.

VI. *The composition and base status of the vegetation in relation to the soil*, S. Mattson and N. Karlsson (pp. 186-203).—Results are presented on a comparison of the composition of plants with that of the soil. "Excess base," Ca, Mg, K, P, N, pH, acidity, and percent base saturation are presented for 56 species of plants from the Dala Brown earth and the Unden and Annerstad Podzol series, the latter including several raised Bog species. The pH is much higher in the Brown earth than in the Podzol and peat, but the base content and the percentage base saturation is about as high in the peat as in the Brown earth. This is because the Podzol and peat acidoids are much stronger than the Brown earth acidoids. The Brown earth has higher isoelectric point. The grand average values for the ash content, the excess base, the Ca, Mg, K, P, N, and the base saturation are all lowest in the Unden (Podzol) vegetation, are somewhat higher in the Annerstad (Podzol and Bog) vegetation, and are two to four times as high in the Dala (Brown earth) vegetation.

The ratios of the Ca : Mg, Ca : K, and Mg : K in the soils are reflected in the plants. There is evidence of antagonism between Ca and K. There is a correlation between the excess base and the nitrogen content of the plants, and it is concluded that most of the excess base comes from nitrate assimilation. By this mechanism, the plants are assumed to be able to pump bases from a lower to a higher level and to live in a soil more acid than the roots. But there must be a critical soil pH for each plant species at which the roots, through proteolysis and exchange, lose bases (cations) faster than they can be accumulated by the absorption and assimilation of physiologically alkaline salts.

Electro-chemistry of soil formation.—VI, *Atmospheric salts in relation to soil and peat formation and plant composition*, S. MATTSSON, G. SANDBERG, and P.-E. TERNING (*Lantbr. Högsk. Ann. [Uppsala]*, 12 (1944-45), pp. 101-118, illus. 1).—This is a continuation of a series previously noted (E. S. R., 93, p. 252).

Results are presented on the Ca : Mg ratios in four series as follows: Dala Brown earth—40 soil samples 8.43, 30 plant species 2.58; Unden Podzol—20 soil samples 1.80, 12 plant species 1.71; Annerstad Podzols—1 peat sample 0.87, 13 plant species 1.46; Ramna Bog—(upper, ombrogenic layer, 0-260 cm) 27 samples 0.48 and (lower layer, 260-360 cm.) 10 samples 1.38, 3 plant species 1.34.

The acid-base condition in vegetation, litter, and humus, V-VIII, S. MATTSSON and E. KOUTLER-ANDERSSON (*Lantbr. Högsk. Ann. [Uppsala]*, 10 (1942), pp. 284-332, illus. 12; 11 (1943), pp. 107-134, illus. 5; 207-217, illus. 5; 12 (1944-45), pp. 70-100, illus. 5).—This is a continuation of a series previously noted (E. S. R., 94, p. 160).

V. *Products of partial oxidation and ammonia fixation* (pp. 284-332).—The present work involves a study of the partial oxidation of organic matter by mild chemical oxidants as well as by auto-oxidation to determine the effect on ammonia fixation and the resulting products. The oxidation was found to result in a higher acidoid content of the residue, dark-colored β acids (beta acids) which are soluble in acids but precipitated by salts of aluminum or iron and have a higher binding capacity for bases, simple organic acids, and carbon dioxide. Fresh and slightly humified litter and unoxidized lignin possess a very high content of weak acidoids which buffer strongly above a pH of about 9. These acidoids are destroyed by the oxidation which yields relatively strong acids and acidoids. The fixation of ammonia is increased by a simultaneous oxidation, whereas an accomplished oxidation, whether in nature or in the laboratory, suppresses the fixation. The ammoniated samples bind less base than the untreated, but in the Foreman titration in alcohol there is a recovery in the capacity to bind base. The results are discussed in relation to soil conditions and in relation to the chemistry of lignin.

VI. *Ammonia fixation and humus nitrogen* (pp. 107-134).—Auto-oxidative ammonia fixation was investigated with a lignin prepared from beech leaves as well as other forms of litter and humus. Ammonia fixation was greatest under a simultaneous auto-oxidation. Very small amounts of ammonia were fixed under anaerobic conditions. Preoxidation depresses the oxidative fixation but increases the anaerobic fixation. The water-soluble and lignin fractions fix more ammonia per unit weight of organic matter than the whole sample. The lower the base status of the litter and humus, the greater is the auto-oxidation and ammonia fixation. The ammoniated complex was found to be stable toward acids, the nitrogen being largely carried over in the lignin fraction obtained by the 72 percent sulfuric acid treatment. Strong alkali removed nearly half of the fixed ammonia.

The ammonia produced by microbial ammonification was found to undergo auto-oxidative fixation by lignin. Exchangeable ammonium ions become fixed by the organic complex. The conclusion is made that the nitrogenous humus complex ("humus nucleus" and "Dauerhumus") is a chemical product resulting from auto-oxidation and ammonia fixation. Titration curves of protein humates and lignates show that the protein suppresses the base binding capacity of the humus and lignin, and that the protein acts as a base below its isoelectric point. Ammonia fixation was shown to be an oxidation reaction. Glucose, fructose, di- and triatomic phenols, and gallic and tannic acids fix large amounts of ammonia, the aromatic compounds as much as 14 percent.

VII. *The acid-base condition during growth of wheat, barley, and red clover* (pp. 207-217).—A new method for the study of the acid-base condition is presented. The original and the electro-dialyzed samples are titrated to obtain two titration curves. By subtraction, a third curve is constructed. These three curves give the content of bases, acids, and acidoids, the acidity, the original, and the pH. It was shown for barley that there is a maximum in the content of bases, acids, acidoids, and nitrogen at some time before the development of the grain. This is followed by a rapid decrease. In red clover, this decrease begins at the time of budding. Red clover contains two or three times as much bases, acids, strong acidoids, and nitrogen as wheat or barley, but the latter contain relatively more of the weak acidoids, thus indicating a less oxidized condition of the lignin.

VIII. *Forms of acidity* (pp. 70-100).—Studies were made with green leaves, of beech, oak, birch, alder, ash, and elm; mosses; lichen; algae; litter; and humus. In determining acidity, a distinction is made between active and potential acidity. The active acidity is divided into soluble acids and hydrolyzable and nonhydrolyzable acidoids. The soluble acids have been fractionated into distillable acids and acids which, on boiling with 12 percent HCl, split off CO₂. The hydrolyzable acidoids include the polyuronides of the hemicellulose fraction (pectins, gums, mucilages), whereas the nonhydrolyzable are represented by the "lignin" acidoids. By subtracting the lignin titration curve from the total acidoid curve, the workers obtain a curve which represents the hydrolyzable acidoids, and which has a form very different from the lignin curve. The hydrolyzable acidoids consist almost exclusively of relatively strong acid groups, whereas the nonhydrolyzable acidoids contain a preponderance of weak phenol hydroxyl groups.

Soil aggregation and onion yields, J. RYNASIEWICZ. (R. I. Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 5, pp. 387-395).—Water-stable aggregates were determined in a Bridgehampton very fine sandy loam under four different 3-yr. rotations, each including onions, and under two corn-potato-3-yr.-hay rotations.

As measured by soil material more than 0.5 mm. in diameter in the onion rotations, the topsoil of the spring samples was better aggregated than the subsoil. No significant difference between the 0-4- and 4-8-in soil layers in the fall was noted. The fall surface samples were better aggregated than the 0-4-in. sections taken in

both seasons. Onions and mangels had a deleterious effect upon soil structure, whereas redtop was beneficial. Corn and buckwheat aggregated the soils slightly more than onions or mangels. The soil under the various onion rotations, and under permanent sod, contained organic matter in the following increasing order: Onions, 2 yr. mangels < onions, 2 yr. buckwheat = onions, 2 yr. corn < onions, 2 yr. redtop < permanent sod. Except in the 0-4 in. spring samples, there was a high positive correlation between organic matter and aggregation. There was a straight-line relation between average yearly onion yields for a 6-yr. period and aggregation of soils sampled in the seventh year. In the corn-potato-hay rotations, soil aggregation under leguminous hay crops was greater in the fall and less in the spring than under nonleguminous hay crops. Potatoes and corn were deleterious to the soil structure, whereas the hay crops were beneficial. The average aggregation for soils under six different crop rotations, and under permanent sod, was in the following increasing order: Onions, 2 yr. mangels < onions, 2 yr. buckwheat < onions, 2 yr. corn < onions, 2 yr. redtop < corn-potatoes-3-yr. leguminous hay = corn-potatoes-3 yr. nonleguminous hay < permanent sod.

On the physical and chemical effects of saline irrigation water on soils, G. HALLGREN (*Lanibr. Högsk Ann. [Uppsala]*, 12 (1944-45), pp. 23-50, illus. 7; *Swed. abs.* pp. 47-48).—Laboratory investigations with a sandy soil, a clay loam, and a clayey loam were conducted to determine the chemical and physical effects of saline water having a salt concentration of 0.5 percent consisting of the following salts: NaCl, 0.39 percent; MgCl₂, 0.05; MgSO₄, 0.03; CaSO₄, 0.02; and KCl, 0.01 percent. Results are given on the effect on permeability, degree of dispersion, water-holding capacity, pH, exchangeable Ca, exchangeable K, and on the solubility of PO₄.

The importance of the method used in wetting a soil, H. R. HAISE and B. T. SHAW. (Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 11, pp. 961-963, illus. 1).—Water atomized by steam pressure was used to obtain various moisture contents in an air-dried sample of Brookston clay which had been passed through a quarter-inch sieve and the moistened soil held in a moisture-proof container for 3 weeks. Of soil so treated, samples containing 32.6, 26.3, and 18.6 percent moisture were compressed at from 0 to 20 lb. per square inch, the volume of soil being such as to yield the same final volume after each pressure. The compressed samples were wetted by capillarity, immersed in water for 24 hr., and subjected to a tension of 49 cm. of water.

The percentage of moisture retained at this tension was found to depend on the initial moisture content; the lower the initial moisture content the less the quantity of water retained. This relationship held throughout the range of pressures applied. Samples of the same soil taken in the spring from a fall-plowed field and treated as above, except that no compression was applied, showed essentially the same moisture contents after the application of the tension of 49 cm. of water, regardless of the four different initial field moisture contents. The results seem to indicate that when the steam-atomizing or similar methods are employed for wetting an air-dry soil to various moisture contents, "caution should be used in assuming that the type of wetting which occurs is the same as that obtained under natural field conditions."

Water infiltration and related soil properties as affected by cultivation and organic fertilization, E. R. PARKER and H. JENNY. (Calif. Citrus Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 5, pp. 353-376, illus. 10).—Rates of infiltration of irrigation water into Ramona loam soil of an experimental orchard of the station were found to vary widely according to fertilizer treatments. Incorporation of organic matter as cover crop or manure greatly increased the rate of water infiltration over that of plots which received only urea as a fertilizer. The improvement was related to the quantity of organic matter applied. Winter cover crops were slightly superior to dairy manure so applied as to supply 1 lb. of nitrogen per tree annually. The

differences in water penetration were corroborated by differences in resistance values (the energy in foot-pounds per inch required to force the sampling tube into the soil, with soil moisture at field capacity) and in core weights (apparent densities) of the soils. To a depth of 9 or 12 in., the soils of the urea plots were heavier and more resistant than the soils of the plots receiving organic materials. Compared with the soils of a dry-farmed area adjacent to the orange grove, the soils of the orchard were characterized by lower rates of infiltration and by greater compaction, especially at a depth of 6 to 12 in. It is suggested that these effects were largely the result of cultivation practices and of traffic in the orchard.

The hypothesis that soil compaction is influenced by traffic and cultivation was tested by subjecting both dry and wet plots of the dry-farmed area to intensive traffic by a track-type tractor and to repeated disking. The effects of the tractor were very detrimental to water infiltration in both dry and wet soil. In the wet soil pronounced soil compaction was produced. Disking of dry soil and of wet soil greatly reduced water infiltration and increased resistance and core-weight values, but the effect on wet soil did not occur until the second irrigation after treatment. Elimination of all cultivation on these plots, in conjunction with the growing of annual cover crops, the above-ground portions of which were removed, produced marked improvement in water penetration during a period of 8 yr. Resistance values and core weights also became more nearly normal during that period.

Permanent wilting percentages of soils obtained from field and laboratory trials, A. H. HENDRICKSON and F. J. VEIHMEYER. (Univ. Calif.). (*Plant Physiol.*, 20 (1945), No. 4, pp. 517-539, illus. 15).—Permanent wilting percentages obtained with sunflower plants agreed whether the determinations were made on entire plants or plants with either a single leaf or a pair of leaves. Permanent wilting percentages obtained were not affected by temperature conditions studied in these experiments, except in those cases where the soil was kept at 41° F. and when the soil was raised to a relatively high temperature by direct sunlight on the metal containers. The minimum soil-moisture content found with plants in containers was lower than that under field conditions, except in the top layer.

The permanent wilting percentage is a recurring soil-moisture condition. Native vegetation or crops under dry farm conditions reduce the soil-moisture content to about the same percentage year after year. Irrigated crops do the same thing if the intervals between irrigations are long enough. The permanent wilting percentage defined by the workers is not a unique value but is a small range of soil-moisture contents within which permanent wilting takes place.

Plant nutrient losses in silt and water in the Tennessee River system, E. O. FIPPIN (*Soil Sci.*, 60 (1945), No. 3, pp. 223-239, illus. 1).—Samples of water and silt were collected at frequent intervals during 1½ yr. at seven locations in the Tennessee River system, three on tributary streams and four on the main river. Chemical analyses were made of each collection of silt for the full period for total and exchangeable calcium, magnesium, and potassium, and total phosphorus and nitrogen. Analyses of the water associated with the silt were made for nearly a full year for total calcium, magnesium, and potassium. Samples of silt also were obtained from the lower Mississippi River and corresponding analyses made. The total quantities of silt and of the several nutrients carried for the year 1939 were calculated from the records of stream flow and silt content and are expressed as quantities per acre of the effective watershed at each location. The total acreage, that of the open farm area, and that in row crops and other relatively exposed land surface were separately measured. From land in the row crop and other relatively exposed soil category, the silt carried averaged 5.20 tons, calcium 84.6 lb., magnesium 97.9 lb., potassium 212.2 lb., and phosphorus 13.0 lb. (all expressed as the oxides), together with 23.8 lb. of nitrogen. The quantity of the three bases as oxides carried

in solution, at normal flow at each location for a full year, averaged per acre of watershed 167.0 lb. of calcium, 31.7 lb. of magnesium, and 7.1 lb. of potassium.

All streams except Duck River were below normal flow in the test period. Records of the annual flow and silt content at each location for 5 yr. from 1935 indicated that, in general, the quantities of silt and nutrients increased sharply with the volume of flow. The composition of the silt varied little, if any, with the level of flow, and watersheds differed chiefly in the content of calcium and phosphorus. Similar data concerning conditions found along the lower Mississippi River are also given.

Effect of certain cultural practices on moisture conservation on a Piedmont soil, E. JAMES. (Univ. Ga.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 11, pp. 945-952, illus. 4).—In blocks of a Cecil clay soil 4 by 1.5 ft. and having a bare surface, a 2-in. mulch, or a 2-in. straw mulch, moisture content readings were made at 6-in. depth intervals to a total depth of 36 in., by means of the Bouyoucos plaster of paris block method (E. S. R., 83, p. 307). The blocks of soil were isolated from the surrounding soil and protected from precipitation for the duration of the experiment after initial saturation.

At the 6-in. level, the moisture content of the soil under the straw mulch remained practically constant while that of the bare soil and that under the dust mulch decreased rapidly to the wilting point or below at almost identical rates. At the 18-in. level, a somewhat slower decrease was noted for all treatments during the first 8 weeks of the test, followed by a rapid loss from the bare soil, a slow loss from the soil under the straw, and an intermediate loss from the soil under the dust mulch. At the 36-in. depth, the results were similar to those observed at the 18-in. depth, except that the drop in the moisture under all treatments began in the fourth week and continued downward to final percentages of 17.3, 20.2, and 22.5 for the bare soil, dust-mulched soil, and straw-mulched soil, respectively. Satisfactory growth of young corn was observed up to 32 days.

Observed temperature differences between the bare and the dust-mulched soil were slight. The maximum difference observed to occur between the bare and the straw-mulched soil was 1.7° C.

Dynamics of wind erosion, I-II, W. S. CHEPIL (*Soil Sci.*, 60 (1945), Nos. 4, pp. 305-320, illus. 6; 5, pp. 397-411, illus. 4).

I. *Nature of movement of soil by wind* (pp. 305-320).—From laboratory experiments of which the technic is described, and some of the results illustrated in photographs showing paths of soil particles in motion, the author finds that because of rapid spinning of the grains moving in saltation and a steep velocity gradient there appears to be a considerable vertical component of wind force near the ground. On account of these effects the grains rise steeply and descend very obliquely toward the surface. As the downward acceleration, due to gravity, and the forward acceleration, due to wind pressure, are approximately equal, the grains fall in almost a straight line. They strike the surface at an angle of 6° to 12°. Movement in suspension and in surface creep is a result of movement in saltation. The whole program of wind erosion control should therefore depend on methods designed to reduce or eliminate saltation. The intensity of soil movement depends not so much on the force of the wind acting on the ground as on its pressure against the grains as they leap in saltation. Soil movement is therefore dependent not on velocity at any fixed height but on the velocity distribution to the height of saltation. Dust in suspension does not affect the general character of the movement in saltation or in surface creep, but the presence of dust in the soil increases the minimum velocity required to initiate erosion and decreases the intensity of erosion for a given erosive wind. Once lifted off the ground, fine dust is carried to great heights and distances from its original location and thus may be considered a complete loss to the eroding area. The soil moved in saltation and surface creep, on the other hand, usually

remains within the eroding area, especially when the erosive winds are from different directions. The maximum diameter of soil particles carried in suspension is on an average slightly greater than 0.1 mm. The proportion of the three types of movement varies widely for different soils. In the cases examined, between 55 and 72 percent of the weight of the soil was carried in saltation, 3 to 38 percent in suspension, and 7 to 28 percent in surface creep. Coarsely granulated soils erode mainly in saltation, and finely pulverized soils in saltation and suspension.

The trapping capacity of stubble or ridged strips depends on the relative receptiveness of the surface and the length of jump of particles in saltation. The data presented supply information on the approximate percentage of soil grains that may be caught by trap strips of different widths. The effectiveness of a particular type of trap depends also on the height and density of the obstructions and on the resistance of these obstructions to the abrasive action of wind-borne grains. Soils vary greatly in resistance to abrasion, but grain stubble is virtually unaffected.

II. *Initiation of soil movement* (pp. 397-411).—This paper reports upon both field and wind tunnel experiments upon threshold wind velocity as affected by various soil conditions, such as roughness of the surface, size of the area undergoing erosion, soil grain size, and others. The threshold velocity was found to vary greatly from day to day by reason of variations in numerous factors.

The threshold velocity was least for grains 0.1 to 0.15 mm. in diameter, these requiring a velocity of 8 to 9 miles per hour at 6 in. above the ground. Above this range of size, the threshold velocity increased with the increase in size of grains, whereas below that it increased with the decrease in the size of particles. For grains above 0.1 mm., the threshold velocity varied as the square root of the product of their specific gravity and diameter. The specific gravity of individual soil grains varied from about 1.65 to 2.65, but the average specific gravity for ordinary mineral soils varied much less than this and differences in threshold velocities caused by differences in specific gravity were generally very small.

Other factors dealt with in considerable detail include the rate of increase of the wind velocity relative to the log-height, effect of undecomposed crop residues, and weeds, even when merely scattered on the surface in absorbing some or all of the drag of moderate winds, the delaying effect of a thin but relatively erosion-resistant crust, after the destruction of which erosion becomes much more rapid, and the sorting action of the wind resulting in accumulations of dunes requiring a much lower threshold velocity than the noneroded field. The threshold velocity for dune materials was the lowest possible in the field and varied little with soil type.

The value of preliming, primarily as a means of improving the absorption of phosphorus by plants, B. E. BEATER (*Soil Sci.*, 60 (1945), No. 5, pp. 337-352, illus. 2).—In experiments on seven representative soils of the sugar belt of Natal and Zululand, the tomato was found to be a satisfactory indicator plant for phosphate deficiency.

The effect of calcium carbonate (1 to 4 tons per acre) on the reaction of the seven soils was traced over a 13-mo. period. The effect of lime on the pH value appeared to depend on the physical composition of the soil and the native calcium already absorbed. Maize plants, followed by sugarcane plants, were grown on the soils prelimed to varying pH values, and the dry plant material was later analyzed for phosphates, nitrogen, and calcium. Preliming generally resulted in a 20-percent increase in the concentration of phosphates in the dry substance, as well as an appreciable increase in the concentration of nitrogen and calcium.

Studies on the life cycle of vetch nodule bacteria, H. Z. GAW (*Soil Sci.*, 60 (1945), No. 3, pp. 191-195).—Morphological changes exhibited by three strains of vetch nodule bacteria grown in nitrate mannitol agar, in vetch extract, in soil glucose agar, in beef peptone glucose, and in "nutrient" agar were studied microscopically

in preparations stained with gentian violet, methylene blue, Barrow's stain, carbol thionine, and carbol fuchsin. Cells from cultures ranging in age from 24 hr. to more than 24 days were examined.

These observations indicated that vetch nodule bacteria do not pass through a complicated life cycle. Their morphology varied with the media upon which they were cultivated, however. On nitrate mannitol agar and on soil glucose agar, the cells appearing in young cultures were mostly cocci and short rods. In cultures 4 or more days old, rods, branched forms, and banded or vacuolated cells were found. More or less spherical granules within some of the cells resembled gonidia, especially when cocci were also present. No positive evidence that these bodies are released from the vacuolated cells to become cocci could be found, however. In the vetch extract medium, rod forms were predominant at all ages of the culture and neither branched forms nor vacuolated cells were seen. In nutrient agar and in beef peptone agar cultures, cocci, with very few rods and no branched forms were seen. In the beef peptone agar cultures, however, vacuolated cells were frequently found.

The morphological variations observed "in no sense represent stages in the bacterial life cycle."

Some observations on the synthesis of polysaccharides by soil bacteria, J. P. MARTIN. (Idaho Expt. Sta.). (*Jour. Bact.*, 50 (1945), No. 3, pp. 349-360).—A *Bacillus subtilis* variety isolated from the soil differed from other strains of this organism and related forms in that a fructosan was synthesized from sucrose when inorganic as well as organic nitrogen was used as the nitrogen source. This organism when first isolated also synthesized a polysaccharide from other sugars besides sucrose. There was evidence that the latter material was different in nature from the fructosan produced from sucrose. *Asotobacter indicum* was found to synthesize chiefly a fructosan from sucrose. The physical properties of this material were different from the levan synthesized by *B. subtilis*. When cultured on glucose, a dextran containing over 30 percent uronic acid units was produced. Two other organisms isolated from the soil synthesized dextrans containing uronic acid units when grown on sucrose medium. Slimy capsular material was synthesized from a wide variety of carbohydrates including plant extracts. Some of the polysaccharides were readily attacked by many micro-organisms; others were relatively resistant to decomposition.

The forest humus layers of Ohio, L. W. GYSEL. (Ohio State Univ.). (*Soil Sci.*, 60 (1945), No. 3, pp. 197-217, illus. 4).—Characteristic features of the humus-layer types found in Ohio are outlined as follows:

The coarse mull occurs typically on fairly well-drained to well-drained silt loams and silty clay loams in well-stocked hardwood stands. It is associated with many different soil and forest types throughout the State. A compact, structureless humus layer beneath the granular surface humus layer is characteristic of many of the coarse mulls of Ohio. The medium mull type was found in habitats similar to those described for the coarse mull. It occurs as a relatively thick layer in fine sandy loams of the Lake Plains and as a shallow layer on the dry ridge tops of the Unglaciated Plateau and on poorly drained silt loams of the Illinoian drift area. A large area of the firm mull has developed as the result of the partial deforestation and grazing of woodlands which originally had other humus layer types. In undisturbed stands, it occurs mainly on poorly drained sites. The fine sandy mull is a type which has not been described previously in the United States. It is a dark gray mixture of sand and fine granular humus material. Superficially, it resembles a fine mull; it differs from this type in that it has a much lower organic matter content, a poorly developed F layer, and occurs to a greater depth. It was found on a fine sandy loam in northern Ohio and on a sand in southern Ohio, in both cases under a mesophytic forest type. The twin mull may be divided into two subtypes

which have different characteristics. One subtype occurs mainly on the dry ridges and south-facing slopes of the Unglaciaded Plateau; it is composed of a matted mor over a medium mull or fine sandy mull. White oak, red oak, black oak, and species of blueberry are characteristic of these sites. The second subtype, which is composed of a fine mull over a coarse mull, occurs on poorly drained clays of the Lake Plains under swamp forest tree species. The matted mor and laminated mor types are so nearly alike that it is suggested that they be combined into one type, the matted mor. This type occurs in two entirely different sites—on the deep, well-drained sands of the "Oak Openings" of northern Ohio and on the dry ridges and upper south-facing slopes of the Unglaciaded Plateau. White oak, black oak, huckleberry, wintergreen, and species of blueberry are characteristic on both habitats. Granular mor was found only under softwoods on sandy or stony loams in north-eastern Ohio.

The organic matter content of the mor types (from 18 to 61 percent by weight) was found to be generally greater than that (from 5 to 20 percent) of the mull types. The mull pH values ranged from 4.7 to 7.3; those of the mor, from 3.7 to 6.3. The total exchange capacity of the mulls was relatively low in comparison with that of the mor types, but the degree of base saturation was generally higher in the mull than in the mor group. Moisture equivalent values of the mull layers ranged from 13 to 36 percent and those of the mor layers from 23 to 42 percent.

Influence of nitrogen sources in the formation of oxidized and reduced organic compounds in plants. A. V. VLADIMIROV (*Soil Sci.*, 60 (1945), No. 4, pp. 265-275).—The authors report upon several years' experiments, greenhouse and field, on the growth and the arsenic and lead contents of crop plants in commercial orchard soils. They found many of the more shallow-rooted crops unable to make even fair growth in the more heavily spray-contaminated soils, and all test crops to contain quantities of arsenic and of lead averaging 2.3 times as much arsenic (calculated as the trioxide) and 1.5 times as much lead (as PbO) as were found in the same plants grown in soils free from spray residues. On the basis of fresh weight, however, the arsenic content averaged only about one-fourteenth of the quantity legally tolerated (3.6 p. p. m. of As_2O_3) on fruits and vegetables, and feeding experiments showed no toxic effects from the consumption of plants grown on the sprayed-over soils.

Nitrates tests for soils and plant tissues. R. H. BRAY. (Ill. Expt. Sta.). (*Soil Sci.*, 60 (1945), No. 3, pp. 219-221).—The author points out that for a study of the nitrogen fertility of a soil, a single soil test or tissue test for nitrates is not sufficient. The nitrate content both of the soil and of the plant should rather be tested frequently throughout the growing season. To facilitate rapid performance of such tests, he describes two forms of the diazotization reaction and dye formation based upon α -naphthylamine and sulfanilic acid. Both methods utilize the effect of manganous sulfate in preventing chloride interference, and in both a large proportion of barium sulfate, relative to the quantities of color-forming compounds, forms a part of the reagent mixture. For quantitative tests, the color is matched to that of one of a series of standards treated like the sample or of a series of acid fuchsin standards. The second method offers the advantage in convenience of field use, of a single reagent in the form of a dry powder, the necessary acid being included in the form of citric acid. Various procedures, covering qualitative and quantitative testing of soils and of plant tissues, are detailed.

Nitrogen depletion by soil organisms. R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii Sugar Planters' Sta.]*, 49 (1945), Nos. 3-4, pp. 251-257, illus. 2).—The results of two preliminary tests are given on the demand of soil organisms for inorganic nitrogen while they are decomposing sugarcane leaves. It was found that approximately 25 lb. of inorganic nitrogen needs to be applied along with each ton of dry cane leaves which may be added to the soil in sugarcane fields.

Effect of sodium nitrate and ammonium fertilizers on the permeability of western soils, M. FIREMAN, O. C. MAGISTAD, and L. V. WILCOX. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron.*, 37 (1945), No. 11, pp. 888-901, illus. 3).—In laboratory permeability studies of 51 soils of the irrigated regions of the West, with water of a chemical composition the same in each instance as that of the normal field irrigation water, the addition of sodium nitrate in concentrations such as are applied in bands in truck crop fertilizer treatment reduced rates of permeability in some soils by as much as 86 percent. The average reduction was 41 percent, and the reduction was serious in about one-half the soils. Differential permeability studies, hydrometer analyses, and base exchange studies indicate that the decreased permeability is due to increased dispersion of the finer fractions of the soil in the zone of fertilizer placement, rather than to an increase in exchangeable sodium. The same quantity of sodium nitrate applied in small increments in the irrigation water had little effect on soil permeability. It is suggested that sodium nitrate be so applied that its concentration either in the irrigation water or in the soil solution shall be kept to a minimum.

Although both ammonium nitrate and ammonium sulfate also showed a tendency, when they were applied in high concentrations, to decrease the permeability of the soil, their effect was considerably less than that of sodium nitrate.

Fertilizer nitrogen consumption, A. L. MEHRING. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 3, pp. 289-295, illus. 2).—The consumption of commercial fertilizer nitrogen in the United States increased from 19,000 tons in 1880 to about 400,000 tons annually in recent years, with the expectation of about 600,000 tons in 1944 and probably in excess of this tonnage in 1945. The author made a study of the factors affecting consumption.

Price factors in plant-food consumption, B. T. SHAW, F. W. PARKER, M. J. B. EZEKIEL. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 3, pp. 282-288, illus. 8).—An analysis of United States fertilizer statistics for the years 1925 to 1941, relative to the influence of plant-food prices on the utilization of plant food in agriculture is presented. The analysis indicates that the percentage nitrogen in fertilizers is a function of the ratio, $N_{price}/(P_2O_5 + K_2O)_{price}$. Also, the proportions of organic and chemical nitrogen used are related to organic and chemical nitrogen prices. Furthermore, the percentage P_2O_5 in fertilizers can be determined from the nitrogen percentage and the ratio, $N_{price}/(P_2O_5)_{price}$. The relations presented describe the way in which farmers and the fertilizer manufacturing industry reacted to changes in prices during the period considered. The estimates of the prospective reaction to other changes in prices assume that this behavior pattern continues in the future as it has been during the past, but may differ somewhat to the extent that new conditions modify the present behavior patterns.

Inspection of commercial fertilizers, F. W. QUACKENBUSH ET AL. (*Indiana Sta. Cir.* 305 (1945), pp. 75, illus. 1).—This circular presents the usual statistics on fertilizer sales and inspection analyses.

Commercial fertilizers in 1944-45, G. S. FRAPS and T. L. OGIER (*Texas Sta. Bul.* 674 (1945), pp. 31).—This bulletin presents statistics regarding fertilizers sold in Texas, information regarding the fertilizer law, and analyses of samples of the fertilizers offered for sale.

The inspection of commercial fertilizers and agricultural lime products for 1945, L. S. WALKER and E. F. BOYCE (*Vt. Univ., Related Serv. Div., Rpt. 1* (1945), pp. 12).—A statistical summary of fertilizer sales and analyses as required by the Vermont fertilizer law. In addition to commercial fertilizers and lime products, the report covers animal manures. Several suggestions are given for the guidance of purchasers.

AGRICULTURAL BOTANY

Injury and death of bacteria by chemical agents, O. RAHN. (Cornell Univ.). (*Normandy, Mo.: Biodynamica*, 1945, pp. 183, illus. 34).—An acquaintance with the death of individual cells is deemed prerequisite to an understanding of the death of multicellular organisms. Although bacteria are not in all respects directly comparable with tissue cells, the fundamental principles involved in death are the same; studies of the death of bacteria therefore furnish a solid foundation for a general investigation of death. An attempt is made in this monograph to sort out experimental evidence and to search for the basic reactions which cause death. The criteria of death refer to the inactivation of different mechanisms indispensable for the life and reproduction of the cell. These may be divided into five groups according to the functions they control: (1) Mechanisms controlling the passage of substances into and out of the cell, represented by the cell membrane; (2) those controlling the energy production for all life activity—the enzymes; (3) the synthesis mechanism, probably involving a large number of catalysts that control the synthesis of cell constituents from the food; (4) the multiplication mechanism, known in the higher organisms to have its seat in the nucleus; and (5) mechanisms consisting of protein molecules which often make up the bulk of the cytoplasm but are without definitely known physiological function though they are essential for the life of the cell. The course of death in bacteria differs from that in all multicellular organisms, their death being related logarithmically to the number of surviving individuals. This "logarithmic order of death" is emphasized in part 1, because it is the key to an understanding of the fundamental cause of death and of the ultimate lethal reaction. The conclusions in part 1 are used in part 2 to explain the cause of death by disinfectants; the great differences between the mode of action of disinfectants and that of antiseptics are also shown. A foreword is by B. Luyet.

Studies on the death of bacteria at low temperatures.—I, The influence of the intensity of the freezing temperature, repeated fluctuations of temperature, and the period of exposure to freezing temperatures on the mortality of *Escherichia coli*, R. S. WEISER and C. M. OSTERUD (*Jour. Bact.*, 50 (1945), No. 4, pp. 413-439, illus. 3).—In the present study—undertaken to elucidate the way in which low-temperature injury is produced—the suspending medium of *E. coli* was 1 percent peptone or a peptone buffer mixture at pH 7; the findings are summarized as follows: Death by freezing involves rapidly acting or "immediate" death, caused by freezing and thawing per se, and a "storage death" which is a direct function of time and temperature. Mortality due to immediate death by freezing is marked but does not vary with the intensity of the temperature. Immediate death occurs at a brief stage in the freezing process during which extracellular ice formation is being completed. The rate of storage death at the higher freezing temperatures is very rapid and is much greater above -30° C. than at -30° and below. Repeated freezing is more lethal than a single freezing or storage frozen for a similar interval of time. Freezing is much more lethal than supercooling. Repeated fluctuations of temperature in frozen suspensions do not exert a lethal action additional to that of storage. Repeated fluctuations of temperature of frozen suspensions between -30° and -78° apparently result in a lower mortality than storage at either temperature, but this protective effect was not observed at temperatures above -30° or below -78° . Storage death at -195° either failed to take place or was so slow that it was difficult to detect within the storage period of 10 hr. used. There are 31 references.

Preparation of silicic acid jellies for bacteriological purposes, B. INGELMAN and I. JULLANDER (*Nature [London]*, 156 (1945), No. 3967, p. 572).—By the method described a mixture of the silico ester and a suitable nutrient solution are autoclaved

in a test tube, in which the gel is formed. The methanol produced—which does not fully disappear and prevents more delicate bacteria from growing—may be removed entirely by a technic outlined in detail. The gels have been tested successfully on *Bacillus vulgaris*, *Leuconostoc mesenteroides*, and *Schizosaccharomyces pombe*.

The nutritional requirements of the lactic acid bacteria and their application to biochemical research, E. E. SNELL (*Jour. Bact.*, 50 (1945), No. 4, pp. 373-382).—This paper—"adapted from an address"—briefly summarizes present knowledge (45 references) of the subject, of its development, and certain of its applications to biochemical research, including the author's detailed investigation of the organic factors required by these bacteria, begun in 1936.

The fermentation of glucose by certain gram-positive, nonsporeforming, anaerobic bacteria, C. S. PEDERSON. (N. Y. State Expt. Sta.). (*Jour. Bact.*, 50 (1945), No. 4, pp. 475-479, illus. 1).—The end products of fermentation produced by 11 cultures of gram-positive anaerobic non-spore-forming species of *Bacteroides* Eggerth were determined. One of these cultures may be regarded as a *Lactobacillus*; 2 are related to *Butyribacterium rettgeri* and 2 others to *Bacterium bifidum*. The 6 remaining cultures were types intermediate between the true sugar-fermenting nonproteolytic lactobacilli and the more or less proteolytic types found in pathologic conditions.

Dissimilation of glucose by *Bacillus subtilis* (Ford's strain), A. C. NEISH, A. C. BLACKWOOD, and G. A. LEDINGHAM (*Canad. Jour. Res.*, 23 (1945), No. 6, Sect. B, pp. 290-296).—This strain (N. C. T. C. 2586) dissimilated glucose mainly to 2,3-butanediol and glycerol under anaerobiosis at pH 6.2 to 6.8. For each 100 moles of glucose fermented, 57 of 2,3-butanediol, 40 of glycerol, 20 of lactic acid, 13 of ethanol, and 5 of formic acid were produced. Aerobic conditions favored the formation of 2,3-butanediol and acetoin, oxidation of the substrate, and formation of acetic and butyric acids but greatly depressed the amount of glycerol and lactic acid produced. In alkaline media (pH 7.5), acids were formed at the expense of the diol and glycerol.

The synthesis of butyric and caproic acids from ethanol and acetic acid by *Clostridium kluyveri*, H. A. BARKER, M. D. KAMEN, and B. T. BORNSTEIN. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 31 (1945), No. 12, pp. 373-381).—When *C. kluyveri* was grown anaerobically in a medium containing ordinary ethanol and synthetic acetic acid labeled in the carboxyl group with C^{14} , labeled butyric and caproic acids were formed. The butyric acid thus formed had C^{14} almost equally distributed between the carboxyl and beta positions; the alpha and gamma positions were inactive. The caproic acid had a third of its C^{14} in the carboxyl group, and probably the beta and delta positions were also labeled. No active CO_2 was formed from carboxyl-labeled acetic acid, indicating that CO_2 is not an intermediate in these reactions. The C^{14} content of the residual acetic acid was much lower than that of the initial acetic acid, evidently resulting from the oxidation of ethanol to acetic acid or a related compound in isotopic equilibrium with it. When the organism was grown with ordinary ethanol and synthetic carboxyl-labeled butyric acid, C^{14} was found in caproic but not in acetic acid. The active caproic acid so formed contained almost no activity in its carboxyl group. These findings are consistent with the view that the formation of butyric acid involves a condensation between acetic acid or a reactive derivative of it—such as acetylphosphate, formed by the anaerobic oxidation of ethanol—and a second molecule of acetic acid. The condensation product is then reduced to butyric acid. Caproic acid formation involves a condensation of the carboxyl group of butyric acid or some related C_4 compound—like butyrylphosphate—with the methyl group of acetic acid.

The paper-disc agar-plate method for the assay of antibiotic substances, E. J. DE BEER and M. B. SHERWOOD (*Jour. Bact.*, 50 (1945), No. 4, pp. 459-467, illus. 3).—

A simplified modification of the Oxford plate method for assaying antibiotic substances is described, and a study was made of the effects on precision of (a) method of measuring dose volumes, (b) depth of agar, and (c) number of test organisms per plate. The log dose-response curve proved to be linear.

The production of a penicillin-like factor by dermatophytes, F. WOLF (*Mycologia*, 37 (1945), No. 6, pp. 796-797).—Note on the production of antibiotic factors resembling penicillin by *Trichophyton* spp. and by *Epidermophyton floccosum*.

The effect of corn steep liquor ash on penicillin production, S. G. KNIGHT and W. C. FRAZIER. (Univ. Wis.). (*Science*, 102 (1945), No. 2659, pp. 617-618).—The findings reported in this preliminary account on culture studies of *Penicillium chrysogenum* indicate that minerals play an important role in the production of penicillin. A difference in the content or balance of mineral elements may explain why some corn steep liquors are superior to others in penicillin fermentations.

Further remarks on mycogenetic terminology, B. O. DODGE (*Mycologia*, 37 (1945), Nos. 5, pp. 629-635; 6, pp. 784-791, illus. 9).—In this further discussion (E. S. R., 93, p. 551), the author takes up heterocaryosis, heterosis, heterothallism, and haplodioecism. The concluding contribution considers the terminology of genetics and of sex in the fungi. There are 26 references.

Species of *Synchytrium* in Louisiana.—III, The development and structure of the galls, M. T. COOK. (La. State Univ.). (*Mycologia*, 37 (1945), No. 6, pp. 715-740, illus. 12).—This installment (E. S. R., 94, p. 170) presents information on 13 species, in all of which infections take place in epidermal cells of the host plant before they are fully mature and are more numerous on the leaves than on other organs. The host-parasite relations are stressed and illustrated. No new taxonomy is involved.

A synopsis of the genera and species of the Sclerotiniaceae, a family of stromatic inoperculate Discomycetes, H. H. WHETZEL. (Cornell Univ.). (*Mycologia*, 37 (1945), No. 6, pp. 648-714, illus. 36).—This taxonomic monograph of the new fungus family Sclerotiniaceae includes a description of the organs and definition of terms, the life history of the group, a key to the genera, and descriptions of the genera and species among which much new nomenclature is involved. Indexes to the species and to host genera are provided, and a bibliography of over two pages is presented.

Sclerotinia bifrons, F. J. SEAVER (*Mycologia*, 37 (1945), No. 6, pp. 641-647, illus. 2).—The specific name *confundus* for this parasite of *Populus tremuloides* is regarded as untenable since the fungus described as *S. confundus* Whetzel in 1940 had been previously recorded as *S. bifrons* Seaver and Sharpe in 1930 and reported as the ascigerous stage of *Sclerotium bifrons* from poplar trees in Colorado. It appears obvious that *S. bifrons* on poplars—like the so-called *Botrytis cinerea*—has more than one ascigerous stage. Whetzel's *Sclerotinia bifrons* now becomes *S. whetzelii* Seaver. An infected leafy twig is illustrated in color.

A change in generic name, G. L. ZUNDEL (*Mycologia*, 37 (1945), No. 6, pp. 795-796).—Because of preoccupation, the author's smut genus *Whetzelia*, with *W. waldsteiniae*, becomes *Ustacystis* n. gen., with *U. waldsteiniae*.

An analysis of the mechanism of budding in yeasts and some observations on the structure of the yeast cell, C. C. LINDEGREN (*Mycologia*, 37 (1945), No. 6, pp. 767-780, illus. 21).—The observations presented reveal that the mechanism of budding exhibited by yeasts is quite unique. The nuclear vacuole is shown to put out a slender tube which forms a small protuberance on the cell wall; as the bud grows, an enlargement in the end of this vacuolar tube produces the bud vacuole. Observations on unstained cells confirmed the Wagner-Peniston concept of the structure of the yeast chromosomes and showed that the polarized chromosomal threads vibrate in the nucleoplasm.

Plants used by the American Indian, F. C. PELLETT (*Iowa State Hort. Soc. [Rpt.]*, 78 (1943), pp. 61-72).—This contribution considers food plants cultivated by the Indians, wild plants and their use by them, dye, fiber, and medicinal plants, plants with mystic qualities, and utility plants.

Notes on some cultivated trees and shrubs, [I], II, A. REHDER (*Jour. Arnold Arboretum*, 26 (1945), Nos. 1, pp. 67-78; 4, pp. 472-481).—The new taxonomy presented in these two contributions "became necessary when, in compiling a bibliography of cultivated trees and shrubs, it was found that in a number of cases older names overlooked or neglected by previous authors existed which called for a change in the nomenclature of certain groups." Members of widely separated plant families are included.

The genus *Isolepis* R. Br., A. A. BEETLE. (Univ. Calif.). (*Amer. Midland Nat.*, 34 (1945), No. 3, pp. 723-734).—The author's compilation of this genus of the sedge family was undertaken to present it in more usable and up to date form and more complete than it could be found elsewhere; to render more intelligible much nineteenth century botanical literature—especially to students not specializing in the Cyperaceae; and to focus attention on the names usually neglected but often valid in combination and thus to contribute to the stability of the nomenclature in the natural genera of the family. Although by far the larger number of the 470 names in *Isolepis* are now synonyms of species or varieties of *Scirpus*, altogether they represent 18 genera now accepted in the Cyperaceae.

Studies in the Sapotaceae.—III, *Dipholis* and *Bumelia*, A. CRONQUIST (*Jour. Arnold Arboretum*, 26 (1945), No. 4, pp. 435-471).—In continuation (E. S. R., 93, p. 411), this revision concerns 14 species of *Dipholis* and 23 of *Bumelia* and includes new nomenclature and keys to the species.

Studies in the Sapotaceae.—IV, The North American species of *Manilkara*, A. CRONQUIST (*Bul. Torrey Bot. Club*, 72 (1945), No. 6, pp. 550-562).—Thirteen species are considered, including new nomenclature and a key to the species.

The genus *Ranunculus* in West Virginia, F. H. BELL. (W. Va. Univ.). (*Amer. Midland Nat.*, 34 (1945), No. 3, pp. 735-743).—This paper is an attempt to classify the wild species found in the State and to render their identification easier to students. Much information—including local data—is given on the 18 species considered, and the identification key includes both those species known to occur and others which, from general distribution data, might be found in the State.

The algae of Crystal Lake, Cleveland County, Oklahoma, D. V. LEAKE (*Amer. Midland Nat.*, 34 (1945), No. 3, pp. 750-768, illus. 1).—This 5-yr. investigation included taxonomic, physical, and ecological studies in an artificial lake covering about 24 acres at an average depth of 5 ft.; the results are reported in detail. The surrounding drainage area supports a mixed-grass prairie type of vegetation, with ground cover adequate to prevent erosion and consequent turbidity of the water. Water birds visit the lake in great numbers during migration periods; some evidence collected indicates that these birds may carry spores or fragments of algae from lake to lake along the path of their migration. The total number of algal species and varieties found was 208; of these, 118 proved to be new records for the State.

The yucca plant, *Yucca filamentosa* and the yucca moth, *Tegeticula* (Pronuba) yuccasella Riley: An ecologico-behavior study, P. RAU (*Ann. Missouri Bot. Gard.*, 32 (1945), No. 4, pp. 373-394).

Wood as a substratum for perennial plants in the Southeast, P. C. LEMON. (Univ. Minn.). (*Amer. Midland Nat.*, 34 (1945), No. 3, pp. 744-749, illus. 6).—Some 25 normally terrestrial species of native perennials have been found growing in decayed wood in the Coastal Plain of Georgia, at least half of them reaching the fruiting stage; 6 perennials were observed growing in wood in North Carolina and some also in northern Florida. These land plants grow on woody substrates

such as natural or man-made stumps or "snags," fallen trunks, dead tops of live trees ("stag-heads"), dead cypress knees, and chopped turpentine "boxes." Roots of *Nyssa sylvatica biflora* frequently enter decayed wood, presumably because the logs and stumps are better aerated than the soil. These growth phenomena may have importance in providing a habitat where plants escape fires and produce seed for replenishing their stand on severely burned areas; such plants may also be the pioneer invaders in swamps that are being gradually filled by soil.

Nitrogen fixation in leguminous plants.—V, Gains of nitrogen by *Medicago* and *Trifolium* in acid and alkaline soil, H. L. JENSEN (*Linn. Soc. N. S. Wales, Proc.*, 69 (1945), pt. 5-6, pp. 229-237).—In this section of the series (E. S. R., 93, p. 20), species of *Medicago* and *Trifolium*—chiefly alfalfa and subterranean clover—were grown in the greenhouse in soils at pH 4.6 to 5.4, in which the reactions were altered to neutral or faintly alkaline by adding CaCO_3 . Determinations of the N in seed, crop, and soil before and after plant growth showed a marked difference between the two genera. Alfalfa at pH 7-7.3 fixed roughly twice as much N as at pH 4.9 to 5.2; in one test there was no significant difference in N gains at pH 5.3 to 5.5, and at pH 7.6. *M. tribuloides* and *M. orbicularis* were strongly inhibited at acid reactions, but could still fix small amounts of N at pH 4.6 to 5.1. Subterranean clover, on the other hand, fixed the same amounts in acid and neutral to alkaline soils, or the net gain was actually smaller in the latter case, when the plants derived a higher proportion of their N from the soil. In the single test made, N fixation in red clover appeared to be actually favored by an acid reaction of the soil. The uptake of combined N from soil of moderate content was increased by adding lime which stimulated the production of nitrate from the soil humus. Only one test with subterranean clover in soil of extremely low N content gave slight but unconvincing evidence that some combined N had been excreted by the roots. A control experiment with soil carrying wheat plants showed no evidence of nonsymbiotic N fixation but, on the contrary, a small net loss of N.

Production of nitrate from roots and root nodules of lucerne and subterranean clover, H. L. JENSEN and D. FRITH (*Linn. Soc. N. S. Wales, Proc.*, 69 (1944), pt. 5-6, pp. 210-214, illus. 1).—The N in root nodules of alfalfa and subterranean clover was nitrified more rapidly than that in the tops, and this again more rapidly than in the root tissues proper. Nearly 90 percent of the nodule N could be converted into nitrate within 5 weeks at 30° C. The rate of nitrification exhibited a significant negative correlation with the C : N ratio of the substances, but showed no correlation with the water-soluble N content. Experiments on the availability of root and nodule N to young wheat agreed with the nitrification tests. The N of dead root nodules thus appears to become readily available to nonleguminous plants, whereas the root substance itself represents a more slowly mobilizable N reserve.

Effect of day-length upon the formation of root nodules on the roots of leguminous plants, M. C. ČAJLACHJAN and A. A. MEGRAJAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 47 (1945), No. 6, pp. 439-443, illus. 1).—In the plants used in the study (bean, soybean, common vetch, mung bean, and *Ervum vicia*) nodule formation was more intense with the long day and at various developmental stages. This intensified nodule development agreed well with the more intense growth of the plant and the greater accumulation of dry matter under the long-day conditions; no relation to the photoperiodic reactions of the plant was noted. It is pointed out that there was a correlation between the intensity of growth and the accumulation of dry matter, on the one hand, and the formation of root nodules on the other, not only within a single species under varying day lengths but in different species under identical conditions. The internal agent creating the favorable conditions for infection by the root-nodule bacteria is believed to be the higher carbohydrate content of the plants on the long day; another factor favoring

these symbiotic relations is probably the higher content in growth hormones formed by the plants under the long-day conditions.

The interrelationship of iron and certain accessory factors in the growth of *Rhizobium trifolii*, strain 205, V. G. LILLY and L. H. LEONIAN. (W. Va. Expt. Sta.). (*Jour. Bact.*, 50 (1945), No. 4, pp. 383-395, illus. 2).—Thiamine, pantothenic acid, inositol, pyridoxine, nicotinic acid, riboflavin, and *p*-aminobenzoic acid—alone and in combinations—were found to be accessory growth factors for *R. trifolii* under certain environmental conditions. In media containing no added Fe and incubated at 30° C., thiamine, pantothenic acid, inositol, pyridoxine, and nicotinic acid—used singly—induced significant increases; at 25°—with or without agitation—thiamine, pantothenic acid, inositol, and pyridoxine caused significant increases. Although ineffective when used singly, *p*-aminobenzoic acid and riboflavin markedly increased the yield when used in combination with thiamine or pantothenic acid. All the vitamin combinations induced significant increases in growth under all three conditions of incubation; the combinations producing maximum growth differed for each condition of incubation. In the presence of 500 µg. of added Fe all seven vitamins—used singly—induced significant increases in growth when the cultures were incubated at 30°; only one combination caused an increase of more than 20 percent in cultures grown at 25° and not agitated. Although 10 combinations of vitamins induced increases of 20 percent or more in cultures incubated at 25° with agitation, the most growth occurred at 25° with agitation in a medium containing thiamine, pantothenic acid, inositol, pyridoxine, and nicotinic acid. Within certain concentrations and in the absence of accessory factors the amount of growth was proportional to the Fe content of the medium. Amounts of Fe greater than 250 µg. per liter failed to bring about additional growth. The pH of the culture medium was also a function of the Fe concentration of the medium, more Fe being necessary to induce the lowest pH than to produce maximum growth.

Tissue responses to physiologically active substances, B. F. THOMSON (*Bot. Rev.*, 11 (1945), No. 10, pp. 593-610).—The sections of this comprehensive review (66 references) have to do with the effects of growth substances applied to various parts of the plant, delay in maturation of tissues by application of growth substances, factors influencing the responses of tissues, the relation of growth substances to crown gall, and the mechanism of response. Summaries of experimental details appear at the ends of these various sections. The most consistent response to treatment of relatively high concentrations of physiologically active substances is found to be cellular proliferation. Crown gall causes abnormal growth resembling that induced by synthetic auxins. The action of auxins in the tissue responses discussed has been interpreted as a mobilization of solid matter toward the site of treatment; the fundamental biochemistry of this action is not yet understood. The exploratory work discussed has opened an important field of inquiry; it is not believed, however, that further accumulation of similar data will contribute to a basic understanding of these phenomena and their significance to growth and development. "A fresh approach is clearly needed."

Auxin and nitrogen relationships in green plants, G. S. AVERY, JR., and L. POTTORF (*Amer. Jour. Bot.*, 32 (1945), No. 10, pp. 666-669).—Leaves and growing points of kohlrabi grown at different N levels were assayed for total extractable auxin—a procedure made possible by a recently developed technic. Within certain limits, the auxin plus auxin precursor in the leaves depended on the amount of nitrate supplied in the nutrient solution; normal or high nitrate nutrition resulted in a total auxin content of leaves approximately 10 times that of N-starved plants. As compared with leaves, the stem tips exhibited but little variation in extractable auxin; normal or high nitrate nutrition resulted in an auxin content only twice that of N-starved plants. Stem tips of plants with adequate N nutrition contained

approximately 5 times as much auxin as the leaves of such plants. Soluble and total N determinations on the stem tips showed a rough correlation between the auxin concentration and N in the tissue, suggesting that within certain limits there is no significant difference in auxin yield when expressed in terms of N content of tissue. The critical range of nitrate concentration in the nutrient solutions—as far as auxin production is concerned—is between “0.01” and “no N.” The plant produces auxin on much less N than it takes to affect growth visibly.

Polyploidy, auxin, and nitrogen in green plant tissue. G. S. AVERY, JR., and L. POTTORF (*Amer. Jour. Bot.*, 32 (1945), No. 10, pp. 669-671).—Leaves and stem tips (with very young leaves) of diploid and tetraploid green cabbage were assayed for total extractable auxin and auxin precursor. Stem tips contained 14 to 20 times as much auxin as the leaves per gram dry weight of tissue, and diploids yielded 2 or 3 times as much auxin as the tetraploids. Nitrogen determinations on leaves and stem tips showed little difference between diploids and tetraploids; thus the wide differences in auxin content of diploid and tetraploid cabbage are not related to N in the tissue.

Studies in the physiology of leaf growth.—I, The effect of various accessory growth factors on the growth of the first leaf of isolated stem tips of rye. R. S. DE ROFF (*Ann. Bot. [London]*, n. ser., 9 (1945), No. 36, pp. 369-381, illus. 3).—The author studied the growth of isolated stem tips excised from rye embryos on a culture medium containing 2 percent sucrose and mineral salts. On this medium growth was almost entirely confined to the first leaf and presented several abnormal features. In the absence of mineral salts growth was much reduced; without sucrose there was no growth at all. The following—added to the medium—failed to produce a significant increase in leaf growth: (1) Crude extracts of peas, rye grains (sprouted or unsprouted), yeast, and a digest of rye endosperm; (2) the B vitamins thiamine, niacin, calcium pantothenate, pyridoxine, riboflavin, and biotin and also ascorbic acid, vitamins E and K, indoleacetic and naphthaleneacetic acids, and the purine derivatives adenine, guanine, uric acid, and caffeine. It was observed that if any isolated stem tip developed a root the entire growing point was stimulated to meristematic activity, and leaves normal in form and size were produced. There are 24 references.

Semi-continuous tap-water aerator. E. C. CANTINO and E. D. HATFIELD. (Univ. Calif.). (*Science*, 103 (1946), No. 2664, pp. 75-76, illus. 1).—For many species, the water culture method of growing plants requires continuous aeration of the nutrient solution. The apparatus described and illustrated has been constructed from inexpensive glassware for use where an air compressor is unavailable. Tap water is forced into a chamber open to the atmosphere only through tubes, and the dropwise rate of water flow is regulated by a stopcock. Air is initially displaced from the chamber until water reaches a certain level; subsequently aeration of the solution commences after the pressure due to the head of water has been overcome. When the water reaches a certain level it is automatically removed by a siphon mechanism; during this short interval, aeration ceases. When the chamber has been emptied, the cycle is repeated and aeration continues. The apparatus requires a minimum of space.

Studies on foliar hydration in the cotton plant.—VI, A gel theory of cell water relations. E. PHILLIS and T. G. MASON (*Ann. Bot. [London]*, n. ser., 9 (1945), No. 36, pp. 297-334, illus. 10).—In continuation (E. S. R., 91, p. 265), the relative distribution of water between vacuole and cytoplasm remained unchanged when attached cotton leaves were caused to swell under the influence of salt solutions applied to the roots. The salt uptake by leaf disks floated on salt solutions was greatly accelerated by light; the uptake was negligible in darkness. Water uptake in response to salt uptake appeared to be independent of light and continued for

some days after salt uptake had ceased; this persistence in water uptake is called the "carry-over." The rate at which water is taken up in response to salt accumulation can to some extent be controlled by preliminary treatment of the disk. Disks "conditioned" by floating on water for several days took up water more slowly when transferred to salt solutions than disks placed immediately on salt solutions; the amount of water taken up did not, however, differ significantly. Osmotically active nonelectrolytes such as sugar caused no significant swelling. The relation between salt and water is linear over a considerable range. These observations are not in harmony with the classical osmotic theory of cell-water relations, but do agree with the view that protoplasm possesses structure, and that this structure, like that of protein gels, can be weakened by salt. Some leaves accumulate salt and do not take up water—e. g., citrus. In such cases it is suggested that the extensibility of the cell wall or the protoplasmic structure (or of both) is unaffected by salt. There are 29 references.

Studies on the partition of the mineral elements in the cotton plant.—V, An adsorption theory of nitrogen regulation, T. G. MASON and E. PHILLIS (*Ann. Bot. [London], n. ser., 9 (1945), No. 36, pp. 335-344, illus. 1*).—In continuation (E. S. R., 91, p. 265), four experiments are described in which the N supply to cotton roots was varied. In one experiment, as the crystalloid N level increased, protein N also increased up to a maximum and then declined markedly. At low levels of crystalloid N, the relation between protein and crystalloid N was much the same from one experiment to another; it is suggested that in this region the protein level is predominantly controlled by the crystalloid N. At higher levels of the latter, the protein levels varied from one experiment to another; it is suggested that these differences in protein level were due to differences in the surface areas available for adsorption, and also that in the region of high protein the extent of the surface might vary in a single experiment as a result of changes in mineral composition. P and K starvation caused a marked reduction in the protein level below what might be anticipated from the protein/crystalloid relation in N experiments. It is suggested that deficiencies in these elements might reduce the extent of the surface and so limit the protein level. There are 13 references.

The effect of ringing and of transpiration on mineral uptake—a reply to criticism, T. G. MASON and E. PHILLIS (*Ann. Bot. [London], n. ser., 9 (1945), No. 36, pp. 345-351, illus. 1*).—Criticisms by Steward (E. S. R., 89, p. 426) of the interpretation of experimental results by the authors on the effects of ringing and transpiration on mineral uptake by the cotton plant are discussed.

Influence of copper upon the potato plant, K. SUKHORUKOV and E. KLING (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 47 (1945), No. 6, pp. 436-438*).—In these experiments an additional supply of Cu introduced into the plant lowered the growth rate and stimulated chlorophyll formation. This reaction to Cu is believed typical of many higher plants. The specific reaction of the potato plant was manifested in an accelerated formation of tubers and an increased resistance to *Phytophthora infestans*.

Rubber in *Cryptostegia* leaf chlorenchyma, R. T. WHITTENBERGER and A. KELNER (U. S. D. A.). (*Amer. Jour. Bot., 32 (1945), No. 10, pp. 619-627, illus. 11*).—Although *Cryptostegia* possesses abundant rubber latex and a laticiferous duct system well developed in all parts of the plant, the major portion of the leaf rubber was found to occur as nonlatex globules in the mesophyll chlorenchyma, entirely distinct from the duct system. These globules were strikingly correlated with the presence of chlorophyll, being largest and most numerous in the palisade cells of fully mature leaves. The physiological significance of the association of the globules with chlorophyll is still unknown. In mature *Cryptostegia* hybrid leaves, 85 to 100 percent of the total rubber is in the chlorenchyma; that remaining occurs as

latex in the laticiferous ducts. The ducts follow the veins throughout the blade and are largest and most numerous along the midrib. Proof that the leaf chlorenchyma globules contained rubber was established by X-ray studies of the isolated globules, after exhaustive staining and microchemical tests on leaf sections. The chlorenchyma rubber—though possessing a *cis*-polyisoprene molecular structure—is apparently of lower molecular weight than that of the laticiferous ducts. The globules contain about 65 percent of rubber hydrocarbon, the remainder consisting largely of acetone-soluble material (resins). There are 37 references.

Flowering of Peruvian cube, *Lonchocarpus utilis* A. C. Smith, induced by girdling. W. C. COOPER, A. L. BURKETT, and A. HERR. (U. S. D. A. et al.). (*Amer. Jour. Bot.*, 32 (1945), No. 10, pp. 655-657, illus. 2).—Girdling the main stems of cube plants in Peru during May was found effective for inducing flowering in September. This is considered a practical field method for cube which should prove a great help both to the genetic and taxonomic studies of this insecticidal plant.

A note on vegetative propagation and tree form in *Duboisia* spp. K. L. HILLS (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 3, pp. 230-233).—Various methods of vegetative propagation of species of *Duboisia* were tried, reproduction from stratified root cuttings proving partly successful and from softwood tip cuttings very much so provided certain conditions of temperature, humidity, and rooting medium were observed. Propagation of contrasting young tree types of *D. leichhardtii* demonstrated that such differences are sustained in the vegetative progeny.

Über Wirkungen der Röntgenstrahlen auf das Plasma vegetativer Pflanzenzellen [The effects of X-rays on the vegetative plasma of plant cells], H. WANNER (*Schweiz. Ztschr. Pathol. u. Bakt. (Rev. Suisse Pathol. et Bact.)*, 8 (1945), Sup., pp. 64+, illus. 15).—The author discusses observations on the effects of X-rays on living cells and on physicochemical changes of the protoplasm (refraction, viscosity, permeability to water) induced by X-rays, followed by a survey of the subject, with bibliography.

Influence of light and temperature on sugarcane and *Erianthus*, J. I. LAURITZEN, E. W. BRANDES, and J. MATZ. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 1, pp. 1-18, illus. 5).—The data presented deal with the effects of different but relatively low intensities of light—at 60°, 65°, 70°, 78°, and 86° F.—on the health, growth, and survival of 21 varieties of sugarcane and 3 of *Erianthus*. Varietal responses to the conditions of light and temperature were demonstrated; in general, the health of the plants improved and growth increased with a heightening of light intensity at each of the temperatures. For each temperature there was a minimum light intensity for survival, health, and growth; the higher the temperature the higher that minimum became. With an increase in light intensity up to about 220 ft.-c. at 65°, and to 1,750 ft.-c. at 86°, there was increased growth. At 60° and a light intensity of about 100 ft.-c. the anabolic and catabolic processes approached a balance and the plants remained in fairly good health for 7 weeks; under this same light intensity at 78° and 86°—particularly at 86°—the life of the plants was impaired and death was common. These findings suggest that for every temperature within the naturally occurring normal range a definite quota of light is required for maximum growth.

Chiasmotypy or the doctrine of delayed action fertilization, E. C. JEFFREY (*Science*, 102 (1945), No. 2661, pp. 653-656, illus. 2).—The author concludes from his discussion of the published facts and theories on fertilization in plants and animals that the chiasmotype hypothesis has no sound basis in fact. Furthermore, since this is deemed to be the case, the possibility of true sexual union (chiasmotypy) normally taking place long after the junction of the gametes—sperm and egg—is finally excluded, as similarly without basis in fact.

Zur Frage des Aufbaues der Primärwand der Baumwollhaare [Cell wall structure in the cotton fiber], K. HESS, W. WERGIN, and H. KIESSIG (*Planta, Arch. Wiss. Bot.*, 33 (1942), No. 1, pp. 151-160, illus. 3).—Based on the previously known chemical and physical properties of the primary wall of the young cotton fiber, a model of its structure is derived and discussed. There are 16 references.

The effect of flax straw maturity on the microscopic structure and dimensions of the ultimate fibres, W. M. P. COOK (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 3, pp. 225-230).—Measurements of the dimensions of ultimate flax fibers when the straw was immature and the plants still flowering showed them to be small and very irregular. When the seed bolls were formed and the stems beginning to turn yellow, the fibers were much more regular in shape but were still small and well filled; at this stage the spinning quality was at its highest. As the straw became more mature, the fibers increased to maximum size, with a corresponding lowering of quality. Among samples taken from three positions in the stem, the smallest and most irregularly shaped fibers were observed in the head, and there was a gradual increase in size down to the butt.

Cytotaxonomy of *Nicotiana*, T. H. GOODSPEED. (Univ. Calif.). (*Bot. Rev.*, 11 (1945), No. 10, pp. 533-592).—During the last 15 yr. there has accumulated a body of morphological, distributional, and cytological information concerning the some 60 valid species of *Nicotiana* sufficiently large and significant for review along with cytotaxonomic conclusions which may be derived from it. The present comprehensive review (157 references) concerns the taxonomy and cytology of the genus and the cytotaxonomy of sections of the subgenera *Rustica*, *Tabacum*, and *Petunioides*, with a six-page list of F_1 interspecific hybrids of *Nicotiana* investigated cytologically.

Les gradients histo-physiologiques et l'organogenèse végétale (Histo-physiological gradients and plant organogenesis), H. PRAT (*Rev. Canad. Biol.*, 4 (1945), No. 5, pp. 543-693, illus. 20; *Eng. abs.*, pp. 689-690).—The idea of gradients—currently used in the physical sciences—is here applied to a study of plant organogenesis. A classification of the different kinds of gradients taking part in the origin and functions of the plant body is first established; these are in constant interaction. The physiological gradients—e. g., intensity of respiration, absorption, and photosynthesis—furnish the origin for various kinds of physicochemical gradients, such as those concerning local pH conditions, glucid concentration, etc. In their turn, these gradients induce local modifications in the development of the cells, hence the appearance of histological and anatomical gradations readily observable in the structure of the tissues and organs. Finally, these histological differentiations react on the functions of the maturing tissues and the cycle is closed, all the gradients being parts of a coherent system the parts of which are all interdependent. Many series of observations by the author are noted concerning the gradients of pigmentation, of water content, and of resistance to heat and to parasitic organisms. Then follows a description of the organization of the gradients in a growing plant—gradients of cell senescence, mitotic activity, maturation and mechanical resistance, and of elongation. Their consideration permits an explanation of the peculiar mechanism of growth in the culm of members of the grass family, viz, a progressive extension, in a telescopic way, of entities growing by their bases and sheltered by the rigid sheaths of the leaves. The histological gradations occurring in the epidermis of the grasses are examined, with a discussion of the mode of development of the cells and the progressive expression of the cell potentialities. Some examples of anatomical gradations in the cereals are given. Over three pages of references are presented.

Studies in the developmental anatomy of *Phlox drummondii* Hook.—II, The seedling, H. A. MÜLLER and R. H. WETMORE (*Amer. Jour. Bot.*, 32 (1945), No. 10,

pp. 628-634, illus. 12).—Part 2 of this study (E. S. R., 94, p. 450) is concerned with changes in organization during seedling development. The results provide the connecting link between the more generalized pattern of organization in the young embryo and the characteristic cylindrical pattern of the adult plant with its localized meristems in the apexes of the shoots and roots.

GENETICS

Heredity and its variability, T. D. *LYSENKO, trans. by T. DOBZHANSKY (*New York: King's Crown Press, 1946, pp. 65+; rev. in Science, 103 (1946), No. 2667, pp. 180-181*).—This calls attention to the author's contention that many characteristics are acquired from the environment and that any theories of heredity that do not recognize that fact must be discarded. Evidences of this condition are cited. The purpose of the book is to make available in English the merits of the Russian controversy and the effects on Darwin's and Mendel's theories in biology. The review is by L. C. Dunn.

Cytogenetics of certain Triticum-Agropyron hybrids and their fertile derivatives, R. M. LOVE and C. A. SUNESON. (Univ. Calif. coop. U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 8, pp. 451-456, illus. 8).—The cytogenetics of *T. durum* (Mendum) \times *A. trichophorum* and of *T. macha* \times *A. trichophorum* and of three fertile derivatives ($2n = 56, 70, 70$) of the first cross and one ($2n = 70$) of the second cross are discussed.

Neurospora, I, II (*Amer. Jour. Bot.*, 32 (1945), No. 10, pp. 671-686, illus. 3).—The following two papers are included:

I. *Preliminary observations of the chromosomes of Neurospora crassa*, B. McClintock (pp. 671-678).—A summary report is presented of the results of a brief study of chromosome and nuclear behavior in this fungus.

II. *Methods of producing and detecting mutations concerned with nutritional requirements*, G. W. Beadle and E. L. Tatum (pp. 678-686).—Among 68,198 single-spore strains of *N. crassa* and *N. sitophila* derived from material treated with X-rays, ultraviolet radiation, or neutrons, over 380 strains with altered nutritional requirements were obtained. On genetic study, many of them proved to differ by single genes from the wild-type strains from which they came. Most of them had altered requirements for B-vitamins, amino acids, or purine and pyrimidine bases. The relation of such mutant types to the hypothesis that genes in general function in determining enzyme specificities and hence control particular chemical reactions is briefly discussed. There are 40 references.

A cytogenetic study of polyembryony in Asparagus officinalis L., T. E. RANDALL and C. M. RICK. (Wash. Expt. Sta. and Univ. Calif.). (*Amer. Jour. Bot.*, 32 (1945), No. 9, pp. 560-569, illus. 12).—Stimulated by the appearance of twin seedlings in cultures of asparagus, the authors studied plants produced from 36 lots of seed, five of which were obtained from controlled pollinations, five from different horticultural varieties, and the rest from various open-pollinated pistillate plants, mostly from the Mary Washington variety. The mean frequency of multiple seedlings in all 36 lots was 0.95 percent. Of the 405 multiple seedlings, 97 percent were twins, the remainder being mostly triplet seedlings.

Diploids constituted 93.2 percent of all plants derived from twin seedlings. The remainder consisted of triploids, trisomics, haploids, and tetraploids. A seedling with a heteroploid number was always associated with a diploid or with a seedling of the same heteroploid number. Diploid always exceeded haploid seedlings in length. Aside from this, relative seedling length was in no way related to chromosome number. Nearly one-half of the multiple seedlings were morphologically attached in varying degrees.

The plants derived from multiple seedlings of the separate type differed, often cytogenetically. The distribution of sexes and stem color in twin seedlings revealed that about three-fourths of the ovules producing them had each been penetrated by two pollen tubes. It was observed that twin embryo sacs may produce dizygotic twin seedlings. In addition about one-fourth of the twin seedlings originate probably from the cleavage of a single embryo. Such cleavage may occur at various stages of development, extending possibly from the first division of the zygote to early growth of the seedling. Early cleavage would likely result in separate but identical multiple seedlings, while later cleavage would more likely produce conjoined seedlings.

Evidence for genetic variation among apomictically produced plants of several F_1 progenies of guayule (*Parthenium argentatum*) and mariola (*P. incanum*), R. C. COLLINS. (U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 9, pp. 554-560, illus. 8).

Natural hybrids between *Oryzopsis hymenoides* and several species of *Stipa*, B. L. JOHNSON. (U. S. D. A.). (*Amer. Jour. Bot.*, 32 (1945), No. 9, pp. 599-608, illus. 71).—Evidence is presented to show that *O. hymenoides* crosses naturally with several species of *Stipa* to produce sterile hybrids previously classified as *O. bloomeri*. The hybrids are similar in characters which are intermediate between *O. hymenoides* and these species of *Stipa*, but are distinct in characters reflecting a different *Stipa* parent in each case. The type specimen of *O. bloomeri* is identified as a hybrid between *O. hymenoides* and *S. occidentalis*. The type specimen of *O. caduca* included in *O. bloomeri* by Hitchcock was identified earlier as a hybrid, *O. hymenoides* × *S. viridula* (E. S. R., 89, p. 196). Six additional hybrids are identified and described under the formulas: *O. hymenoides* × *S. elmeri*, × *S. thurberiana*, × *S. californica*, × *S. scribneri*, × *S. robusta*, and *O. hymenoides* × *S. columbiana*.

A genetic analysis of the American Quarter Horse, J. L. FLETCHER. (La. Expt. Sta.). (*Jour. Hered.*, 36 (1945), No. 11, pp. 346-352, illus. 3).—A breed analysis made of the American Quarter Horse by methods developed by McPhee and Wright (E. S. R., 54, p. 430) for the British Shorthorn showed a coefficient of inbreeding of 1.7 percent, with coefficients of relationship of 0.98 to 3.02 percent in representative samples. King Ranch horses showed a coefficient of inbreeding of 4.89 percent and an inter se relationship of 20.11 percent. King Ranch horses showed direct relationships of 6.69 percent to Peter McCue and 40.29 percent to his grandson Old Sorrel. More than 50 percent of the animals in the study traced to at least one Thoroughbred ancestor, and in King Ranch horses 97 percent traced to at least one Thoroughbred. The average interval in years between generations was 8.99.

Pregnant mares' urine as a source of oestrogens, W. G. STEVENSON (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 11, pp. 293-301).

Evaluation of species crosses of cattle by polyallel crossing: A study of zebu and Africander × Aberdeen-Angus cattle under subtropical conditions, A. O. ROAD, R. W. PHILLIPS, and W. M. DAWSON. (U. S. D. A.). (*Jour. Hered.*, 36 (1945), No. 12, pp. 367-374, illus. 1).—In cattle breeding experiments at the U. S. D. A. Iberia Livestock Experiment Farm, Jeanerette, La., sires of the breeds zebu, Africander, zebu × Angus, and Angus were found to differ significantly in the weights of calves produced and ranked in this order when mated to the same nine Angus cows. The breed of sire was also significantly associated with weight at 6 mo. of age in an analysis in which zebu, Africander, and zebu × Angus bulls were ranked in that order, but the variations were not large enough to be significant. A limited number of data indicated that the offspring of zebu × Angus cows as dams were somewhat lighter at birth but heavier at 6 mo. than those from Africander × Angus cows, but the cows were mated to comparable types of bulls. Evidently hybrid calves carrying zebu or Africander blood are superior to Angus calves under

conditions prevailing in the Gulf of Mexico Coastal Plains area at 6 mo. of age. Differences between zebu and Africander cattle are not so clear cut, but they are in favor of the zebu cross. There was a small positive correlation between weights at birth and 6 mo. Polyallel crossing technic reduces losses in crossing or hybridization studies by eliminating differences between dams or sires or both. In the present study only the breeding of dams was constant, thus standardizing maternal factors that may have influenced results. Possibilities of critical analyses are indicated, and the method is adapted to wider application in animal breeding experiments.

Predicting the transmitting ability of young dairy sires for milk production, butterfat test, and butterfat production, H. C. DICKEY and P. LABARTHE. (Colo. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 12, pp. 893-900, illus. 3).—In studying 214 pedigrees of Holstein sires and their progeny records in U. S. D. A. Miscellaneous Publication 487 (E. S. R., 87, p. 846) for transmitting high dairy production, two methods were compared. The first utilized the production value of the sire and the dam of each sire, and the second used Rice's concept of the regression of these values on the breed average. Each of these estimates of a bull's value was combined with the mate's production to predict the production of the progeny. Milk production, butterfat test, and butterfat production were studied by correlation coefficients of predicted and actual production values, which were about six-tenths.

Seasonal variation in the reproductive capacity of the bull, J. ANDERSON (*Jour. Agr. Sci. [England]*, 35 (1945), No. 3, pp. 184-196, illus. 17).—Seasonal variations in the reproductive capacity of nine bulls were studied during a total of 1,049 ejaculates, as well as supplementary data for two other large farms practicing artificial insemination. Highly significant individual and monthly differences were noted for the density and motility of the sperm and the pH of the semen, but considerable variation in different years was apparent between bulls and between farms. Nutritional and climatic effects are discussed. Warmer conditions caused stimulation in certain cases, and the opposite effect was noted in others. Nutritional factors may be an influencing effect on the seasonal variations in the quality and fertility of the semen.

A study of performance in Hereford cattle.—I, Progeny testing of Hereford sires. II, Type as an indicator of performance, E. B. STANLEY and R. MCCALL (*Arizona Sta. Tech. Bul.* 109 (1945), pp. 35-53+).—The steer calf progeny of three Hereford sires were compared as to the amount of gain, economy of gain, pounds of cold carcass per 100 lb. of gain, feeder grade, and carcass grade. The calves of one sire were heaviest, whereas the calves of another sire ranked first in carcass yield. There was little uniformity in the feed-lot records of steers produced by the same sires and dams. The differences in the genetic make-up of full brothers caused little uniformity in the feed-lot records of their progeny. It is concluded that attempt should not be made to evaluate less than 8 progeny of any sire, and 10 or 12 give a more reliable appraisal. There was a high correlation between the amount of gain and its feed cost. Gains during a period of ad libitum feeding gave an accurate appraisal of the performance of the progeny. There was a significantly negative correlation between height at withers, corrected for weaning weight, and daily gain, indicating greater gain for steers weighing heavy in relation to height. Other significant correlations with daily gain are weaning weight and net return. Significant correlations with carcass grade were corrected cannon circumference, corrected fullness at stifle, and corrected height at withers. Feeder rating and carcass value per 100 lb. were significantly correlated in type tests of 8 to 10 groups for each of 10 yr., but the correlation of feeder grade and carcass grade was not significant in progeny tests. Since the appearance of a steer is not a dependable criterion of growth rate and gain efficiency, efforts should be made to acquire a maximum of those feeder qualities associated with carcass quality such as thickness

of body, weight for height, quality, size of bone, and quiet disposition. Light colored hair and weight for age may be related to rapid growth in feeder cattle. Carcass grade was better indicated by body conformation than feed-lot performance. Ultimate carcass grade was more fully indicated by condition than by conformation, particularly in light-weight cattle.

Effect of increased fecundity in swine induced with the aid of the SPM [serum of pregnant mares] gonad stimulating hormone. B. M. ZAVADOVSKY (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 47 (1945), No. 3, pp. 225-228*).—It was found that injections of sows with serum of pregnant mares increased the numbers of pigs farrowed by approximately one individual per litter. The average results showed in the three experiments that the control dams produced 8.5, 9, and 8.2 pigs per litter as compared with experimental sows which produced 9.6, 10, and 9.5 pigs per litter. These pigs showed approximately the same weights.

A polydactyl gene in mice capable of nearly regular manifestation. S. B. HOLT (*Ann. Eugenics, 12 (1945), No. 4, pp. 220-249, illus. 8*).—Over 400 polydactylous mice were observed in an inbred strain. All except two cases were in the hind feet. The first digit was affected. The expression is variable, and one or both feet may have six, or more rarely seven, toes. Polydactyly is due to a recessive gene, *py*. The degree of penetrance is affected by modifying factors. The results in crosses with different stocks were variable, but by selection a line was obtained in which penetrance was almost complete (90 percent manifestation). The literature on polydactyly is reviewed, with special reference to whether the polydactyly described by different authors results from the effects of the same gene.

A new eye color mutant in the mouse with asymmetrical expression. L. C. DUNN (*Natl. Acad. Sci. Proc., 31 (1945), No. 11, pp. 343-346*).

Pure strain mice born to hybrid mothers following ovarian transplantation. W. L. RUSSELL and J. G. HURST (*Natl. Acad. Sci. Proc., 31 (1945), No. 9, pp. 267-273, illus. 2*).—The only method of testing directly for multiple gene or strain differences in maternal environments is by a somewhat tedious process of transferring fertilized ova from one strain to another. Offspring from ovarian transplants were used for this purpose by comparing pure strain and hybrid maternal environments. In 22 operated hybrid ♀♀ with grafted ovaries from *dba* ♀♀, offspring were obtained. In a total of 3 inbred strains and 6 hybrids the results were successful. In some the ova regenerated and could only be detected by following out a pre-arranged schedule and identifying the phenotypes.

A dactylolysis mutation in the fowl. R. N. SHOFFNER (Univ. Minn.). (*Jour. Hered., 36 (1945), No. 12, pp. 375-378, illus. 1*).—Of 451 White Plymouth Rock progeny 81 were defective, having a sclerodermic condition of the feet. Affected chicks appeared quite normal until 1 week of age. The first unusual symptom was a hard glassy appearance of the sole of the foot, accompanied by a slight swelling, which cracks and finally interferes with the chick's movement, and the distal end of the toe atrophies. The character is semilethal, due to the difficulty of coping with the environment and possibly in part to adverse action on the chick of the condition itself. Under practical conditions of competition with normal chicks the condition may be entirely lethal. The mutation behaves as a mendelian recessive.

FIELD CROPS

Pasture studies indicate possibilities of more productive grass and legume mixtures for irrigated land. W. KELLER, G. Q. BATEMAN, and J. E. PACKER. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.], 6 (1945), No. 4, pp. 7-10, 15, illus. 10*).—High-yielding pasture mixtures under comparison contained either smooth brome, orchard, or tall fescue grasses with red clover, Ladino clover, or

alfalfa as the legume. Combinations of these species also were highly productive. In contrast, yields were relatively low if either Kentucky bluegrass, meadow fescue, meadow foxtail, or perennial rye was the predominant grass, or if strawberry clover or any of several sources of ordinary white clover was the predominant legume, or any of these species in combination. On fertile land and with rotation grazing, Kentucky bluegrass and white clover have yielded only about half as much forage as other mixtures. Leaders in the palatability classification were smooth brome, reed canary, and orchard grasses, and Ladino and alsike clovers.

The yields, palatability, and anticipated longevity of nine pasture mixtures are tabulated and suggestions made for establishing pasture on irrigated land.

Pasture fertilization, R. H. LUSH (*Amer. Fert.*, 103 (1945), No. 12, pp. 10-11, 26).—A review of the use of fertilizers on pastures, referring in particular to results of and practices derived from research of experiment stations in the Southern States.

Alfalfa varieties under irrigation, H. P. SINGLETON, C. E. NELSON, and C. O. STANBERRY (*Washington Sta. Bul.* 464 (1945), pp. 32, illus. 12).—Varieties of alfalfa in the resistant group, i. e., Ladak, all strains of Turkistan, and new strains or varieties developed for resistance, proved superior to all others in comparison at the Irrigation Branch Station 1921-44. Turkistan (19300), 1934-44, was the most outstanding variety, combining high yielding ability with winter hardiness and wilt resistance. Hardistan and Ladak both were very winter hardy and yielded well, but Hardistan does not set seed readily. Ladak, less resistant to wilt than the Turkistan strains, excelled northern common strains in winter hardiness, wilt resistance, longevity of stand, and yield. Ranger, Buffalo, and Orestan, newer resistant varieties, have been tested to a limited extent. Northern common strains from Montana, South Dakota, Idaho, and Washington were superior to other wilt-susceptible varieties except Kansas common, in yield and stand maintenance. Kansas common strains were about equal to the northern common strains, but the Utah common strains were intermediate between northern and southern common strains. Southern common strains and nonhardy varieties, as Peruvian, were too susceptible to wilt and not winter-hardy enough for central Washington. Variegated susceptible varieties, including Grimm, were more susceptible to wilt than the northern common strains and usually yielded about 0.5 ton per acre less.

Fertilizers for irrigated alfalfa, I, II, H. P. SINGLETON, C. E. NELSON, and C. O. STANBERRY (*Washington Sta. Bul.* 465 (1945), pp. 29, illus. 7).

I. *Effect of fertilizer elements upon yield* (pp. 4-22, 28-29).—Alfalfa grown on Sagemoor fine sandy loam at the Irrigation Branch Station was not depressed in yield by N, P, K, Ca, or S. N, K, Ca, or S alone or in combinations had little influence on yields. P fertilizer alone or in any combination caused outstanding yield increases, except on newly reclaimed land or on areas where much manure had been applied. No combination with one or more of N, K, Ca, or S was materially better than P alone. On areas where available P was definitely a limiting factor in alfalfa production, treble superphosphate applied at the annual rate of 75 lb. per acre produced very good results, and as much as 150 lb. produced much larger yields economically. Manure, 10 tons per acre annually, was as effective as heavy P applications in maintaining alfalfa yields. Weed percentages on P-treated plots were noticeably less than on no-P plots.

II. *Effect of fertilizers on the chemical composition of alfalfa* (pp. 22-28, 29).—Alfalfa hay from P or S plots contained the greatest N percentage, but differences were not pronounced. That from check plots at the Irrigation Branch Station contained a considerably smaller percentage of P_2O_5 than the average value for alfalfa hay given by Morrison (E. S. R., 91, p. 725). P or manure applications materially increased the percentage of P_2O_5 in the plant material, thereby improving the quality

of the hay for feed. At Satus, where an adequate program of manuring and pasturing had been maintained previously, yields and P content of alfalfa hay were not increased materially by phosphate applications. The K content of the hay was increased by the use of K fertilizer or manure, whereas its Ca content was decreased by application of P or K, and was not increased by application of Ca to the soil. Average analyses of alfalfa from check plots showed that the hay with the highest P content had the lowest Ca content, and that alfalfa with the least P had the most Ca.

Factors affecting alfalfa seed setting and production in Utah, J. W. CARLSON. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 4, pp. 3, 15, illus. 1).—The four factors currently appearing to have special significance in the growing of alfalfa seed in Utah and other western States include tripping and cross pollination by wild bees and honeybees (E. S. R., 92, p. 648); lygus infestation and damage; the breed or variety of alfalfa used for seed production; and cultural practices, water relationships, and soil conditions affecting the growth of seed crop.

Essai d'identification des orges cultivées en France [Identification of the cultivated barleys in France], P. BERGAL and L. FRIEDBERG (*Ann. Epiphyt. et Phyto-génét.*, n. ser., 6 (1940), No. 2-4, pp. 157-306, about 20 illus.).—Barley varieties grown in France and other countries in western Europe, as well as a number not cultivated there, are discussed and classified with appropriate determinative keys. Detailed descriptions of spike, vegetative, and physiological characters are provided for 77 varieties. Characters used in identification and description are discussed and illustrated.

El maiz, fabuloso tesoro [Corn, fabulous treasure], C. C. VIGIL (*Buenos Aires: Editorial Atlántida*, 1944, pp. 116+, illus. 10).—A popular treatise on the growing and use of corn, particularly in Argentina.

Measures to check deterioration in Egyptian cotton varieties.—I, The Giza seed maintenance system; II, Development of new varieties; III, Extent, nature, and causes of deterioration, H. A. HANCOCK (*Jour. Textile Inst.*, 36 (1945), No. 11, pp. T267-T310, illus. 4).—Part 1 (pp. T267-T277) of this contribution from the Egyptian Cotton Research Board deals with the Giza seed maintenance system; part 2 (pp. T278-T292) with the development of new varieties by selection from an established variety or from new crosses, the inheritance of extreme characters, interpretation of results in selection, introduction of new varieties, spinning values, and reaction upon agricultural economy; and part 3 (pp. T293-T309) with the extent, nature, and causes of deterioration.

A comparative study of some properties of kapok, D. A. CLIBBENS (*Bul. Imp. Inst. [London]*, 43 (1945), No. 3, pp. 180-209, illus. 4).—Investigation by the British Cotton Industry Research Association showed that kapok could be obtained from sources other than Java of such quality as to be indistinguishable, after suitable processing, from Prime Java kapok in any of the properties examined. The several tests considered geometrical characters, rigidity, chemical properties, and over-all specific volume of kapok compared to other fibres; effect of pressure, humidity, and temperature history on over-all specific volume; buoyancy and its measurement; and life jackets. Kapok is defined and comment made on commercial uses.

Empire—a blight resistant variety, D. REDDICK and L. C. PETERSON. (Cornell Univ.). (*Amer. Potato Jour.*, 22 (1945), No. 12, pp. 357-362).—Empire, a new potato variety derived from a cross of a high-yielding selection (No. 9) from Rural New Yorker No. 2 with a hybrid seedling, is resistant to late blight, resembles Rural New Yorker No. 2 in several characters, yields well, and has satisfactory culinary qualities. In general, Empire may be considered a substitute for Rural and may be expected to do well in the areas where Rural has been standard. Empire was released in 1945 to growers for increase.

American seedsmen as vendors of seed potatoes, E. V. HARDENBURG. (Cornell Univ.). (*Amer. Potato Jour.*, 22 (1945), No. 12, pp. 373-375).—The declining role of catalog seedsmen in the market for seed potatoes since Stuart's classification (E. S. R., 32, p. 830) of American varieties and the development of a Nation-wide program for production of certified seed is discussed, and comments are made on the subsequent marketing of an increasing proportion of the total seed crop by certified seed growers and seed growers' associations.

Effect of planting depth on yield and tuber set of potatoes, O. A. LORENZ. (Univ. Calif. coop. U. S. D. A.). (*Amer. Potato Jour.*, 22 (1945), No. 10, pp. 343-349).—In depth-of-planting tests 1942, 1944-45 with White Rose potatoes (E. S. R., 92, p. 46) at Shafter on Hesperia sandy loam and at Davis on Yolo silt loam, comparisons were made when the top of the seed piece was planted 2, 4, 6, and 9 in. below the ridge surface. Plantings 4 and 6 in. deep produced higher total yields than did the 9-in. Total yields from 2-in. planting were only slightly lower than for the 4- or 6- in., but sunburn made the yield of marketable tubers much lower. The percentage of sunburned tubers became less as planting depth was increased up to 6 in. The number of tubers per hill became smaller while size of tuber and depth of tuber set increased with depth of planting. When moisture was sufficient, plants from shallow plantings tended to emerge first.

Hail damage to soybeans—report of 1943 results, R. F. FUELLEMAN. (Univ. Ill.). (*Ill. State Acad. Sci. Trans.*, 37 (1944), pp. 25-28, illus. 1).—Richland soybeans drilled in 24-in. rows at the Illinois Experiment Station in 1943 were subjected to 30, 50, and 75 percent defoliation (simulating hail damage) on seven dates from June 29 to September 6. Severe reductions in yields resulted from all rates of defoliation during the period of pod formation and filling—August 1 to 15. While the results obtained may be expected to differ slightly from those with other varieties which may vary in time of flowering and pod formation, it is considered probable that the relative yields would vary but little. Heavy hail damage during early growth and previous to blossoming evidently reduces yield very materially, whereas light hail damage in this period does not depress yield.

The effect of nitrogen fertilization upon the yield and composition of sugar cane, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii Sugar Planters' Sta.]*, 49 (1945), No. 3-4, pp. 259-312, illus. 17).—The influence of N. fertilizer on the yield and composition of 32-8560 sugarcane, harvested periodically, was studied on a fertile reddish-brown loam at Makiki. A 3 × 3 factorial plan with its three amounts of N and three times of application made up 9 of 10 treatments, and a "no N" or control plot completed each block. Related work has been noted (E. S. R., 92, p. 204; 93, pp. 36, 147).

The contribution made to the total supply of available N by the soil varied from month to month, and must be considered in studies of N effects on field-grown crops. Much of the well-recognized effect of N on cane quality is probably a direct effect of N on the stalk population. Both dead canes and suckers were involved, and influenced both yields and crop composition. The maximum amount of leafy green tops, found at 6 to 9 mo. and definitely affected by N, suggested the possibility for maximum photosynthesis at this age. Moisture in the plant and percentage of reducing sugars were increased when N applications were increased. Sucrose concentration increased rapidly between 6 and 11 mo., but was lower in the more liberally N-fertilized crop of the first year's harvests, although not significantly lower thereafter. Effect of N on percentages of total sugars was influenced by the age of the crop at harvest. In very young cane, the higher N produced a lower concentration, but after 9 mo. a directly opposite effect was indicated.

Increased N applications were reflected definitely by the increased N concentrations within the different crop or plant samples analyzed. Critical levels are tenta-

tively suggested for 32-8560 cane at 11 mo. of age as 0.316 percent N in total dry weight, 1.36 percent N in leaf punch samples, 1.02 percent N in entire leaf blades, 0.028 percent N in crusher juice, and 0.0196 percent amino N in elongating cane.

Studies of the "primary index" or the percentage of total sugars in the active leaf sheaths showed a wide range in variability from replicated plots. Averages at 11 mo. did not differ significantly from canes which had received different amounts of N. Positive relationships were indicated between percentage of total sugars in leaf sheaths, percentage of moisture in the same sheaths, and of percentage total N in the leaf punches, and the yields of total dry weight; each of these items increased as a result of increased N applications. Both total green and dry weights and yields of millable cane rose with increased N. The greatest increase, occurring between 3 and 6 mo., suggested a dominant effect of age over season. Higher N applications resulted in poorer cane quality principally in the younger crops harvested. Interactions between amounts and time also influenced cane quality.

Yields of sucrose, of total sugars, and of commercial sugars showed most rapid increase between 6 and 12 mo. The commercial sugar yield made at 12 mo. from high N applications was outstanding. Both the total amount of N applied and time of application influenced commercial sugar yields, and these influences have differed for crops harvested at different ages. Total amounts of N recovered in total dry weights reflected differences in amounts made available, but recovery was less complete from higher applications. Rate of uptake was fastest during the first 6 mo.

The increased N applications have reduced the ratio of percentage of total sugars to percentage of N; lowered the ratio of N recovered to N applied; increased the amount of N recovered per ton of cane harvested; resulted in a lowered N efficiency, i. e., higher amounts of N needed per ton of cane and sugar; increased the ratio of percentage reducing sugars to percentage sucrose, especially during the first 18 mo.; had slight effect on the ratio of yields of total sugars to total dry weights, but increased the ratio of tons of reducing sugars to tons of dry weight during the first 18 mo.; had no effect on the ratio of tons sucrose to tons dry weight after 9 or 10 mo., nor little effect on that for commercial sugar to sucrose; and had not changed the ratio of millable cane yields to total green weights. Apparently significant interactions may exist between the weather elements and the age of the crop when these elements are received.

Effects of deficiencies of certain mineral elements of the development of *Taraxacum kok-saghyz*, B. S. MEYER. (Ohio State Univ. et al.). (*Amer. Jour. Bot.*, 32 (1945), No. 8, pp. 523-528).—Deficiency of N for Russian dandelion (*T. kok-saghyz*) resulted in by far the smallest fresh or dry weight yield of roots of any treatment. Deficiency of Mg or K also resulted in appreciably smaller fresh and dry weight yields of roots compared with the checks, while deficiency of Ca or P had relatively much less effect. Indications were that the same mineral element deficiencies having the most marked retarding effects on root development also have the greatest influence in reducing rubber accumulation in the roots. Specific foliar symptoms were recognized only for N and Ca deficiencies. No marked correlations were found between floral initiation and mineral element deficiency.

Tobacco Substation at Windsor, report for 1944, P. J. ANDERSON, T. R. SWANBACK, ET AL. (*Connecticut [New Haven] Sta. Bul.* 487 (1945), pp. 265-291, illus. 3).—Research with cigar-leaf tobacco (E. S. R., 91, p. 411) reported on was concerned with band application of fertilizer, irrigation experiments, relative values of phosphates in fertilizing tobacco, and efficiency of N in oil meals and effects on the soil. Incidence of diseases in 1944 and control of early damping-off in seedbeds are noted on page 631. Tables show the acreage and production of Broad-leaf, Havana Seed, and shade tobacco in the Connecticut Valley for the years 1942-44

and average for 1932-41, and tobacco stocks on hand and cigar consumption 1933-44.

Band application of tobacco fertilizer (pp. 269-274).—Applying the fertilizer to the soil 1 or 2 weeks before setting the plants has not increased yield or improved grading in experiments, 1940-44. It might be applied at the grower's convenience up to the setting date. Band application of fertilizer, in bands on either side of the row, 4 in. from the plant stalk and about 4 in. deep, has increased grading but not the yield. The amount of fertilizer applied in bands may be reduced below the requirement for broadcast application without impairing the cash value of the crop. During a dry season there is danger of root injury from a too strong fertilizer solution in the soil if the fertilizer bands are within 4 in. of the row. Root-burned plants either die or start slowly, necessitate restocking, and result in uneven stands.

The irrigation experiment of 1944 (pp. 275-278).—In 1944, a year with the lowest rainfall during 23 yr. of records, nonirrigated plots produced short leaves of poor elasticity and color and no quality, and moreover, many leaves were yellow and lifeless, typical symptoms of N starvation. Plots irrigated without nitrate had larger leaves, but many were yellow and lifeless. Irrigated and nitrated (200 lb. sodium nitrate per acre added to irrigation water) plots had leaves of the best size, color, and quality and there were no yellow leaves. Yield and grading records revealed an increase of 200 lb. per acre when water alone was used, and 200 lb. more when sodium nitrate was put in the water. The grade index also rose proportionately in the same order, the relative crop value being almost doubled by water and sodium nitrate.

Tobacco irrigation experiments during fifteen years (pp. 278-282).—Principles of irrigation derived from experiments since 1930 include methods of applying water, time, frequency, and rate of irrigation, how much nitrate to apply, and the economy of the practice.

Relative value of phosphates in fertilizing tobacco, T. R. Swanback, H. A. Lunt, and P. J. Anderson (pp. 282-288).—Best results in fertilizing Havana Seed tobacco in field tests, 1940-44, as judged by yield and grading, were obtained from calcium metaphosphate and triple superphosphate. Precipitated bone and bone-meal were next in order of effectiveness, whereas potassium calcium metaphosphate and potassium metaphosphate gave results no better than mixtures omitting P carriers. Soil analyses for P, clay, colloids, water retention, and pH failed to provide an adequate explanation for the relative values of these phosphates.

Efficiency of nitrogen in oil seed meals and some of their effects on soil, T. R. Swanback (pp. 288-291).—Results in 1944 indicated clearly that almost identical yields and grading could be obtained from cottonseed meal, castor pomace, and soybean meal, when N is supplied on an efficiency basis. Castor pomace may be used pound for pound to replace cottonseed meal, or 1,600 lb. of soybean meal may be substituted for 1 ton of cottonseed meal or castor pomace. The three materials evidently do not vary in their effect on soil reaction when N is applied on an efficiency basis. Indications were that more Ca leaching is induced by cottonseed meal than by the two other materials. There was a tendency of greater economy in use of N from soybean meal than in that of the other two meals. The proportion of carbon added to the soil to lost carbon was 0.83 to 1 for cottonseed meal, 0.67 to 1 for soybean meal, and 0.70 to 1 for castor pomace. Castor pomace and soybean meal would nitrify as rapidly as cottonseed meal.

The inspection of agricultural seed for 1945, L. S. WALKER and A. S. LUTMAN (*Vt. Univ., Related Serv. Div., Rpt. 2* (1945), pp. 12).—Germination and purity guaranties and variations found are tabulated and discussed from tests of 374 samples of field crops seeds and forage mixtures secured from dealers in Vermont in 1945.

HORTICULTURE

Growth and yields of cabbage, sprouting broccoli, and tomato plants hardened by chemicals in nutrient solution and later grown at different levels of nitrogen, phosphorus, and potassium, H. D. BROWN, R. DUNN, and E. K. ALBAN. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 305-308, illus. 2).—In 1944 broccoli, cabbage, and tomato plants grown in nutrient solution were hardened by withholding nitrogen and by increasing the osmotic pressure of the nutrient solution by additions of K_2SO_4 and $CaCl_2$. The seedlings were then potted and some held at high and some at low levels of N, P, and K. The broccoli and cabbage were grown to maturity in the permanent fertility plots and the tomatoes in greenhouse water culture plots. The tomato plants hardened by K_2SO_4 additions developed longitudinal stem cracks, curled leaves, and darkened roots. Tomato plants hardened by withholding N had white roots, but the leaves were yellowed.

For the tomato plants grown in May and June and set in the fertility plots in the greenhouse on June 26, there were about 33, 64, and 69 percent survival in those hardened by withholding N, use of K_2SO_4 , and use of $CaCl_2$, respectively. Sprouting broccoli and cabbage hardened by the same three methods showed better survival when set in the field on June 1. Ultimately the broccoli and cabbage plants hardened by K_2SO_4 and $CaCl_2$ outyielded the N-limited group. However, in view of the peculiar growth effects of high osmotic concentrations this method of hardening is not recommended at present.

Propagating cabbage by root cuttings, C. L. ISBELL (Ala. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 341-344, illus. 7).—Cuttings ranging from 4 to 6 in. in length were made from roots taken on January 11 from the base or crown of a large Savoy-type cabbage plant. The cuttings were placed in sand in a greenhouse bed and within 16 days all had developed one or more shoots. Later, when transplanted to the garden, the young plants developed into normal heads. In the succeeding year the experiments were successfully repeated with other varieties of cabbage. The method is recommended to plant breeders as a valuable means of increasing selected plants. The root cuttings may apparently be taken at any season of the year.

Dent, flint, flour, and waxy maize for improvement of sweet corn inbreds, E. S. HABER. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 293-294).—Various inbred lines of field corn were used successfully in the development of sweet corn. Inbred field corn lines are considered more valuable than open-pollinated material, because many of the deleterious characters have been eliminated by the breeders. Tough pericarp, a character associated frequently with field corns, may be eliminated readily or not incorporated. Toughness of pericarp may be measured by mechanical means or by the simple chewing test. The author discusses various dent and flint types that have been used in sweet corn development, and asserts that much can be gained in improving sweet corn inbred lines by crossing with selected lines and varieties of field corn.

Use of the refractometer for selecting onion bulbs high in dry matter for breeding, L. K. MANN and B. J. HOYLE. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 285-292, illus. 8).—Large and small bulbs selected from a commercial lot of Southport White Globe onions were, after removal of all dry and partly dry outer scales, divided into three approximately equal portions of outer, middle, and interior scales. The percentage of dry weight increased from the outer to the inner scales. Although the outer scales did not constitute a representative dry-weight sample, their dry weight was sufficiently well correlated with bulb dry weight as to yield a reading practical for breeding purposes. The refractometer reading of the juice of the two outer fleshy scales is easily obtained and correlates

well with the percentage dry weight of the bulb. Data are presented for several varieties including Southport White Globe, Australian Brown, Mountain Danvers, California Early Red, and a clone of Italian Red. Within some varieties, a significant correlation was found between fresh weight of the bulbs and their percentage of dry matter. In selecting bulbs for breeding use, it is believed there would be little to be gained by adjusting for bulb size in estimating percentage dry weight. Varieties with relatively low percentage dry weight had large average bulb size. On the basis of samples studied there is presented a curve for regression of percentage dry weight of the whole bulb based on refractometer readings of the juice of the outer scales.

Propagation and culture of garden sage in Tennessee, J. P. OVERCASH. (Tenn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 345-349, illus. 4).—Stem cuttings taken from old plants with desirable leaf characteristics were treated with various root-promoting substances in the form of powder. All four materials used caused an increase in the number of cuttings to form roots. With the control at 58 percent, the most successful material gave 84 percent rooting. In addition the growth-promoting substances increased the number of roots per cutting and general vigor of the young plants.

In the spring of 1943 and 1944 plants were exposed to different daylengths in a greenhouse. The long day, 18 hr, was most conducive to profuse blooming. Information is given on yields, effects of mulching and spacing, and improvement by use of selected clones.

Some items of interest to Kentucky nurserymen for the year ended June 30, 1945, W. A. PRICE and H. G. TILSON (*Kentucky Sta. Regulat. Ser. Bul.* 44 (1945), pp. 11).—In the usual manner (E. S. R., 92, p. 654) information is presented on various important insect and disease pests and names of certified nurserymen and nursery stock dealers, both resident and nonresident.

The terminology of fruit maturation and ripening, R. V. LOTT. (Univ. Ill.) (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 166-172, illus. 1).—The author discusses the confusion that exists in the literature and current usage with respect to the terminology concerning the maturation and ripening processes in fruits and makes a number of recommendations with respect to standardizing terminology as to maturity and ripening and color description. As to color, the use of a spectrophotometer is urged when such an appliance is available and in its absence the use of the Munsell Book of Color.

Some factors affecting apple yields in the Okanagan Valley, II, III (*Sci. Agr.*, 25 (1945), No. 12, pp. 739-775, illus. 11).—A continuation of the series (E. S. R., 93, p. 582).

II. Soil depth, moisture holding capacity, and pH, J. C. Wilcox (pp. 739-759).—This discusses the relation of soil depth, moisture-holding capacity, pH, and lime content to production in the McIntosh apple. A total of 74 plots scattered through the Okanagan Valley and representing a considerable range of soil types was used. The depth of soil ranged from 17 to at least 60 in., the gravel content from 0 to 43 percent, and the moisture-holding capacity from 1.34 to 4.67 in. per foot of soil. Lime was present in the surface 8 in. of soil in only a small percentage of the plots. Below 8 in. the presence of lime depended primarily on the texture of the soil. In sandy soil no lime was recorded in the 8- to 24-in. layer and almost none in the 24- to 60-in. layer. In heavier soils, lime was present usually in moderate amounts in the 8- to 24-in. layer and in larger amounts in the 24- to 60-in. layer.

The soil pH was influenced by soil depth, soil texture, lime content, and the applied fertilizers. The deeper heavier soils had on the average higher moisture-holding capacities, more lime, and higher pH values than the lighter, shallower soils. No evidence of a true hardpan or of excess moisture was seen in any plot.

As to production, the heavier and deeper was the soil, the higher was the total yield and also the yield of high quality fruits. The tendency to biennial bearing was less in the heavier and deeper soils. The higher the pH, the higher the total yield, but computations showed that this relation was involved with superior water-holding capacity.

III. *Root distribution*, J. C. Wilcox and A. T. Knight (pp. 760-775).—The authors discuss root distribution of the apple tree as affected by certain soil characteristics and soil treatments and the relationship of root distribution to growth and productivity. Root concentration was found to be variable even around individual trees. Concentration of fibrous roots tended to be greater with older trees, closer to the trunk, and in the soil layer between the 6- and 24-in. depths. A grass sod lessened the number of apple roots in the top 6 in. In deep soils roots of older trees filled the soil to a depth of at least 8 ft. In shallow soils underlain by clear sand and gravel the roots grew rarely down more than a foot into the sandy subsoil except directly under the trees. Within a pH range of 6.0 to 8.0 the higher values were associated with the greater number of roots. No significant correlation was observed between the concentrations of available phosphorus and potassium in the soil and the number of fibrous roots. There were no observable effects of applications of sulfate of ammonia, superphosphate, or muriate on root growth, but heavy applications of borax and boric acid killed fibrous roots near the surface. Heavy watering accompanied by good drainage favored growth of fibrous roots. No relationship was found between the number of fibrous roots and tree vigor, but a positive but non-significant correlation was obtained between the number of fibrous roots and the yield.

The effect of Malling I, II, and XIII rootstocks on several apple varieties, R. H. SUMMS. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 227-229).—Further information (E. S. R., 89, p. 670) is presented on the results of apple rootstock experiments conducted at Kearneysville, W. Va. The Malling II rootstock proved to be very satisfactory for producing trees of good productivity and of considerably less than standard size for four varieties, namely, Jonathan, Staymared, Starking, and Golden Delicious. York Imperial on Malling II resulted in trees of very irregular size and low yield. Gallia Beauty did better on stocks promoting very vigorous growth. Thus far neither Malling I nor Malling XIII have shown any promise as apple stocks at Kearneysville. Red Rome and Gallia Beauty tend to bear too early on these stocks. In general rootstocks which cause any degree of dwarfing of these two varieties are deemed undesirable in the Cumberland-Shenandoah area.

Studies on control of magnesium deficiency in New York apple orchards, D. BOYNTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 1-5).—In the autumn of 1942 McIntosh apple trees of bearing age in orchards in Orange and Wayne Counties, N. Y., were selected because of the presence of blotch symptoms of magnesium deficiency. In the spring of 1943 certain trees were fertilized with 100 lb. of dolomitic limestone by spading the material into the soil beneath the temporarily removed sod. In 1944 limestone applications were repeated in both orchards.

Soil samples collected in September 1944 showed marked increases in pH and in calcium and magnesium to a depth of 1 ft. Analyses of leaf samples showed that the lime increased leaf magnesium percentages slightly in the Orange County orchard in the first year and gave a partial control of blotch. Leaf analyses in 1944 showed more Mg than in the preceding year and almost complete absence of blotch. Unfortunately even the control trees showed less blotch in 1944. An application of 10 lb. of epsom salt to the sod in addition to the lime showed no apparent benefit. Somewhat comparable results were recorded in the Wayne County orchard.

In 1943 and 1944 trees in an Orange County Baldwin orchard, which was badly blotched in the heavy crop year of 1942, were sprayed twice with either epsom salt or high Mg hydrated lime solutions. No fruit was borne in 1943 or 1944 and no blotch of any significance occurred either year. There was noted some increase in the percentage of Mg in the leaves.

In 1943, when the epsom salt was added to the regular flotation sulfur and lead arsenate cover sprays, there was some marginal and tip burning of leaves with considerable premature dropping of affected leaves. However, in other locations in the same years no such injury was observed. When epsom salt was applied in separate sprays in 1944, no injury occurred in the same Baldwin orchard. Both the epsom salt and the dolomite lime sprays increased the percentage of Mg in the leaves. Two cover sprays including 16 lb. of high Mg lime per 100 gal. were as effective in increasing leaf Mg as were two sprays including 16 lb. of epsom salt.

Further data on correcting magnesium deficiency in apple orchards, L. SOUTHWICK and C. T. SMITH. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 6-12).—Further observations (E. S. R., 92, p. 371) on the corrective effects of spray and soil applications of magnesium on magnesium-deficient apple trees showed that the inclusion of 20 lb. of epsom salt per 100 gal. of spray solution in three early season applications was rather effective in preventing the appearance of Mg deficiency leaf scorch in the year of application. The epsom salt sprays are deemed particularly valuable for trees which may be slow in responding to soil applications of magnesium materials.

Soil applications of epsom salt and kieserite were beneficial in young mulched trees, but one application of dolomite, kieserite, or epsom salt was substantially ineffective in a seriously deficient orchard under sod culture. The application of commercial magnesium oxide 92 percent MgO appeared to result in greater increases of Mg in apple leaves on young trees than the use of epsom salt applied in similar amounts by weight. Commercial dolomite limestone is apparently less beneficial than other materials, even when used in relatively large amounts, unless epsom salt was also applied.

Apple thinning with caustic sprays applied during the blossom period, L. P. BARTER, H. H. MOON, and C. F. KINMAN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 94-101).—Experiments were conducted in 1943 and 1944 on the varieties York Imperial, Yellow Transparent, Grimes Golden, and Golden Delicious trees located in orchards near Martinsburg, W. Va., and Hancock, Md. Results obtained in the 2 yr. were decidedly contrasted. The generally greater reduction in fruit set in 1943 on York Imperial and Grimes Golden is attributed to temperature differences. In 1943 temperatures were relatively low and winds were strong, tending to reduce bee activity. The 1944 season was much more favorable, suggesting that with certain varieties the use of blossom thinning sprays is commercially feasible only when conditions are favorable for pollination and fruit set. Appreciable reduction in fruit set without overthinning was obtained with Yellow Transparent in 1943, indicating that this variety possesses unusual capacity to set fruit under adverse conditions.

Tests of different concentrations suggest that under the conditions of the tests it is not necessary to use a stronger concentration than 0.2 percent Elgetol. Dinitro-ortho-cresol powder gave much the same results as Elgetol when used in equivalent strengths. The amine salt of dinitro-ortho-cresol D.N. No. 111 showed promise in the one test in which used. *

Although sprays applied at full bloom to Grimes Golden and Golden Delicious were somewhat more effective than those applied 32 and 72 hr. after full bloom, the effect of the delayed sprays was such as to indicate that flowers already fertilized may be killed by such sprays. There was some evidence that the later sprays caused

less leaf injury than did the full bloom sprays. High tree vigor was not found to be necessarily associated with decreased effectiveness of the blossom thinning sprays.

Peach orchard soil management: Influences of soil covers on tree growth, fruiting, and erosion control, C. O. DUNBAR, R. D. ANTHONY, and E. B. KINTER. (Coop. U. S. D. A.). (*Pennsylvania Sta. Bul.* 476 (1945), pp. 28+, illus. 9).—Field experiments conducted in the vicinity of the Arendtsville Fruit Research Laboratory located in southern Pennsylvania and discussed in the bulletin showed that, in general, a system of management which grows heavy annual covers, preferably legumes, in the fall, winter, and early spring months, when soil moisture is plentiful and which permits trashy cultivation in late spring and early summer, offers the most promise of growing desirable trees and producing satisfactory crops and in the end leaving the soil in condition to grow another profitable orchard.

Undisturbed sods are successful soil builders but in drought periods check peach tree growth on shallow soils, decrease the crop, and cut down size of the fruit even when supplementary nitrogen fertilizers are used. Annual cover crops may become harmful to the trees if allowed to continue heavy growth into early summer when the trees should be growing vigorously.

Late summer or fall-sown annuals such as rye, ryegrass, and especially the legumes crimson clover and vetch, all of which make their growth in the fall and spring, are valuable in maintaining the fertility of the soil without checking seriously the productivity of the trees. A successful system of soil management is one that maintains a balance between soil maintenance and tree growth. Various factors such as depth and fertility of the soil, degree of slope, and variety or varieties of peach grown are among factors that must be considered in the development of a successful soil management system for any given orchard. On eroded areas, a nitrated straw mulch is a useful supplement for preventing serious soil losses.

Observations on growth differences of sweet and sour cherries grafted onto mazzard and mahaleb body stocks, K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 211-214, illus. 2).—Giant sweet and Montmorency sour cherry trees developed by bench grafting during the dormant season on mazzard and mahaleb seedlings at a height of 26 in. from the root crown were planted in May 1940 in a well-drained soil well-suited to cherries. After 5 yr. both the Giant and Montmorency had made notably more height growth on mazzard than on mahaleb roots. Another lot of trees planted in 1943 behaved similarly. All the trees planted in 1940 on mahaleb stocks bore a few fruits the third season from planting with increasing crops in succeeding years. Giant on mazzard bore a few fruits in 1944 but Montmorency did not produce. The results indicate that a distinct dwarfing of cherry trees is obtained by using mahaleb stocks as both root system and trunk. Both Giant and Montmorency appeared fully congenial on mahaleb, and it is considered possible that mahaleb understocks might be used in the above manner to produce small cherry trees comparable to dwarf apples or pears.

Bush fruits, D. S. BLAIR (*Canada Dept. Agr., Farmers' Bul.* 131 (1945), pp. 22, illus. 9).—Information is presented on the growing of raspberries, blackberries, currants, and gooseberries under Canadian conditions. Particular consideration is given to varieties and their adaptability to various parts of the Dominion.

Solving the problem of winter injury of the red raspberry, A. S. COLBY. (Univ. Ill.). (*Iowa State Hort. Soc. [Rpt.]*, 78 (1943), pp. 98-108).—As some of the most important causes of winter injury to the red raspberry in the northern United States, the author discusses severe cold, immaturity of the primocanes, winter desiccation of the canes, varying temperatures, and poor soil drainage. Suggested control measures are outlined.

A study of rootstocks for Concord, Ontario, and Delaware grapes, C. A. MAGOON, I. W. DIX, and J. R. MAGNESS. (U. S. D. A.). (*Amer. Soc. Hort. Sci.*

Proc., 46 (1945), pp. 222-226).—From 1933 to 1942 a rootstock investigation was conducted at Beltsville, Md., comparing the growth and fruiting of Concord, Ontario, and Delaware grapes on various rootstocks and on their own roots. Of the 11 rootstocks *Constantia*; *Vitis monticola* × *V. riparia* No. 18815; and *V. riparia* × *V. rupestris* No. 3309 were generally superior to own roots for Concord and Delaware. Increase in yield and vine growth was general on these varieties and stocks although the increase in individual plots was not always significant. The yields of Concord and Delaware on the other rootstocks were greater than for own-rooted vines only in occasional combinations. Ontario yielded less on most of the rootstocks than on own-rooted vines. Only on *V. monticola* × *V. riparia* N. 18815 and on *V. riparia* × *V. rupestris* No. 3309 were Ontario yields greater than on own-rooted vines, and these increases were not statistically significant.

Temperature and maturity in relation to raisin production, E. SNYDER and F. N. HARMON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 249-252).—The drying ratio of fresh grapes to the resulting raisins tended to decrease as the sugar (Balling scale) of the fresh fruit increased. Thus at the higher sugar readings less fresh fruit is required to make 1 lb. of raisins. About 4.7 lb. of fresh fruit at sugar percentages ranging from 17 to 19 were needed to make 1 lb. of raisins, while only 3.5 lb. of fresh fruit with 23 to 25 percent of sugar were required. For each degree rise in sugar in the fresh grapes between 18 and 26 percent an additional 23.5 lb. of raisins may be obtained from a ton of fresh grapes.

In general, fresh grapes with the lower sugar readings produced raisins of a lower sugar content. The acid content of the raisins decreased rather uniformly as the maturity of the harvested grapes increased. Acid content varied with the variety. For example, acid content of Corinthe Noir was considerably higher than in either Sultanina or Muscat of Alexandria raisins. The average number of day degrees that intervened between blossoming and ripening varied with varieties and indicates the earliness or the lateness of a variety in reaching the requisite sugar percentage.

Some factors influencing the growth of date offshoots in the nursery row, W. W. ALDRICH, G. H. LEACH, and W. A. DOLLINS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 215-221, illus. 1).—From 1938 to 1943 various studies were conducted at the U. S. D. A. Date Garden, Indio, Calif., to determine the best methods for handling date offshoots. Much better survival was obtained with rooted than with nonrooted offshoots of the Zahidi variety. Among conditions favoring survival of rooted offshoots were (1) the use of medium or large rather than small Deglet Noor offshoots, (2) avoidance of sufficiently frequent irrigation of relatively water-impervious soil to cause water to stand on the surface either half or more of the time, and (3) planting unwrapped Khadrawy offshoots in April, June, or July rather than in February.

Prompt planting of offshoots was advisable. When only two offshoots were left on the parent palm during the 18 mo. prior to offshoot removal, the two averaged 24 percent heavier and made 53 percent greater growth extension during the first 3 mo. after planting than did comparable offshoots from nonthinned palms. Furthermore the parent palm with only two offshoots made considerably more growth than did the nonthinned. The number of inflorescences was increased in the year following the thinning of the offshoots, suggesting that a number of months elapse before factors influencing floral differentiation take effect.

The Brooklyn Botanic Garden chestnut breeding project, A. H. GRAVES (*North. Nut Growers Assoc. Ann. Rpt.*, 35 (1944), pp. 22-31, illus. 6).—First-generation Japanese-American chestnut hybrids resemble closely the American parent in appearance, but are not quite as susceptible to blight. Many of the hybrids show hybrid vigor in the form of extremely rapid growth. By inarching vigorous shoots emanating from the base of diseased trees into the limbs it was found possible to

prolong the life of the trees so that nuts could be obtained for a second generation. In addition crosses were made on an American chestnut which had escaped the blight. Altogether the author has some 1,000 hybrid chestnuts under observation at Hamden, Conn., with smaller numbers at two other locations.

Chestnuts in Connecticut, D. F. JONES. (Conn. [New Haven] Expt. Sta.). (*North. Nut Growers Assoc. Ann. Rpt.*, 35 (1944), pp. 35-38, illus. 3).—Brief observations are presented on a number of Chinese chestnut seedlings and hybrids received from the U. S. Department of Agriculture and other sources and planted on the station grounds at Mount Carmel, Conn.

Hickory species and stock studies at the Plant Industry Station, Beltsville, Maryland, C. A. REED. (U. S. D. A.) (*North. Nut Growers Assoc. Ann. Rpt.*, 35 (1944), pp. 88-121, illus. 36).—Descriptions are offered of a number of species, species hybrids, and selected varieties under observation for their value as nut producers, understocks for selected varieties, and for use as shade trees. Information is given on the botanical characteristics and natural range of the various hickory species.

Growth and general performance of plant materials used as hedges, D. WYMAN (*Amer. Soc. Hort. Sci. Proc.*, 46 (1945), pp. 423-426).—As a result of observations on a group of 115 hedges planted for the most part either in the fall of 1936 or in the spring of 1937 and given moderate care in the succeeding years, the author separates the species into four classes: (1) Satisfactory, (2) second choice, (3) doubtful value, and (4) decidedly inferior, and presents tabulated data as to height and width, habit of growth, etc. A surprising number of plants fell in class 1, indicating that a wide variety of woody shrubs and trees made suitable material for development of hedges.

FORESTRY

Careers in forestry (U. S. Dept. Agr., Misc. Pub. 249, rev. (1945), pp. 23-4, illus. 9).—This is a revised edition (E. S. R., 78, p. 789).

Varying hare and forest succession, D. B. COOK and S. B. ROBESON (*Ecology*, 26 (1945), No. 4, pp. 406-410, illus. 2).—Observations on a high population of snowshoe hares on Valcour Island in Lake Champlain indicated that even in the presence of inadequate food there occurred considerable selectivity in choice of food. White pine, red pine, and white spruce seedlings less than 4 ft. tall were killed outright, and taller trees of these species were trimmed as high as the hares could reach. Balsam fir and white cedar were not fed upon. Paper birch and aspen were readily eaten, but are of relatively little importance either commercially or in the biology of the forest. The authors deem the snowshoe hare to be a potential menace to coniferous plantings, especially those providing a suitable ecological environment for the hares.

DISEASES OF PLANTS

Lewis Ralph Jones, 1864-1945, G. W. KEITT and F. V. RAND (*Phytopathology*, 36 (1946), No. 1, pp. 1-17, illus. 1).—A biographical sketch (E. S. R., 92, p. 880), with portrait and a seven-page classified list of published writings.

The Plant Disease Reporter [September 15-October 15 and November 15, 1945] (U. S. Dept. Agr., *Plant Disease Rptr.*, 29 (1945), Nos. 25-26, pp. 659-686, illus. 6; 27, pp. 687-708, illus. 2).—In addition to brief seasonal notes on diseases of trees, potatoes, peonies, lilies, corn, and rutabagas, the above issues contain the following signed notes and articles:

No. 25-26.—Host-parasite check list revision, *Uniola-Zizaniopsis* (Gramineae), by F. Weiss; dwarf bunt of winter wheat in New York, by L. J. Tyler (Cornell Univ.); condition of cereal crops in North-Central States in August, by D. G. Fletcher;

diseases of forage crops in West Virginia, by R. E. Atkinson, K. W. Kreitlow (Pa. State Col.), and J. G. Leach (W. Va. Univ.); the outcome of the late blight potato epidemic in Kansas, by L. E. Melchers (Kans. State Col.); outbreak of late blight on canning tomatoes in Indiana, by R. W. Samson (Ind. Expt. Sta.); southern blight of the pimiento, by E. K. Vaughan and A. L. Taylor; a preliminary report on internal cork, a probable virus disease of sweetpotato, by C. J. Nusbaum (S. C. Sta.); apricot diseases in coastal California in 1945, by C. E. Yarwood (Univ. Calif.); and violet scab found in Illinois for the first time, by J. L. Forsberg and G. H. Boewe (Ill. Nat. Hist. Survey).

No. 27.—Host-parasite check list revision, *Abrus-Astragalus* (Leguminosae), by F. Weiss; summary of the more important plant diseases taken in connection with the insect and plant disease survey in the general vicinity of ports of entry from January 1945 to June 30, 1945, by W. S. Fields; unreported powdery mildews, II, by C. E. Yarwood (Univ. Calif.); elm phloem necrosis in Arkansas and Oklahoma, by H. W. Larsh; myrothecium crown and stem canker of greenhouse snapdragons in Colorado, by S. Wilhelm, W. Gunesch, and K. F. Baker (Univ. Calif.); a report on the eelgrass situation in the Annisquam (Massachusetts) and Mystic (Connecticut) tidewater rivers in the summer of 1945, by R. W. Dexter; diseases of vegetable crops in Palm Beach and Broward Counties, Fla., by G. R. Townsend, R. C. Cassell, and E. L. Felix (Fla. Sta.); tomato tip blight in Texas and notes on other disease conditions, by P. A. Young (Tex. Sta.); and notes on boron deficiency of apple in Pennsylvania, by F. H. Lewis and F. N. Hewetson (Pa. State Col.).

[Indexes to Supplements 134–138, 1942, and 140–143, 1943] (U. S. Dept. Agr., *Plant Disease Rptr.*, 1945, *Supp.* 139, pp. 162–172+; 144, pp. 145–150—).

Mark-frøafgrødernes sygdomme og skadedyr [Diseases and pests of agricultural crop plants], C. STAPEL and P. BOVIEN (*København (Copenhagen): K. Danske Landhush. Selsk.*, [1943], pp. 232, *illus.* 48).—This handbook is illustrated by 48 colored plates.

Les virus: Etudes biochimiques et biophysiques récentes [The virus: Recent biochemical and biophysical studies], W. M. STANLEY, C. A. KNIGHT, and L. J. DE MERRE (*New York 17: Belgian Amer. Ed. Found.*, 1945, pp. 81, *illus.* 5).—Following a general discussion and presentation of definitions, this comprehensive review (336 references) considers viruses in relation to their composition and structure, dimensions and forms, characteristic physicochemical properties, the influence of various physical and chemical agents on them, methods of extraction and purification, and their biological properties—synthesis and multiplication, transmission, combined action, serology, inclusions, and methods of dosage.

A comparative study of two closely related root-rot fungi, *Clitocybe tabescens* and *Armillaria mellea*, A. S. RHODES. (Fla. Expt. Sta.). (*Mycologia*, 37 (1945), No. 6, pp. 741–766, *illus.* 6).—The taxonomy of *C. tabescens* is discussed with reference to the assumption by some that it is merely an exannulate form of *A. mellea*. The importance of isolating the fungus—in the absence of sporophores—for diagnosis of the two root rots is indicated. Infections by these closely related fungi have been found to agree with respect to the symptoms exhibited, the general appearance and growth of the mycelial sheets, development of xylostroma outgrowths extruded through longitudinal fissures in the bark, their marked predilection for oak roots, and their ability to develop either parasitically or saprophytically. The root rot by *C. tabescens* differs, however, in the absence of the black, rounded or flattened, cortical and hypogaeal, stringlike rhizomorphs, and the perforate character of the younger mycelial sheets and their less fan-shaped type of development at the advancing margins. Culture studies of a large number of isolates demonstrated still further striking differences, which are described in detail. Pure cultures of *C. tabescens* consistently failed to exhibit any luminescence—in contrast to *A. mellea*—and it also

had a distinctly higher temperature range, which appears to account for its largely replacing *A. mellea* in Florida and other Southeastern States; 40°C. proved lethal to both. The growth of neither fungus was sufficiently limited by pH values to offer practical application for control. There are 21 references.

Some host plants of *Comandra umbellata* in Colorado, H. D. HARRINGTON. (Colo. State Col.). (*Amer. Midland Nat.*, 34 (1945), No. 3, pp. 797-798).—In the list of 45 plant species found attacked by this phanerogamic parasite only *Bouteloua curtipendula* is said to have been previously reported as a host for any species of *Comandra*. These hosts are members of 17 families, the grasses and composites accounting for almost half of the total; no annual was found to be attacked. All but 5 of the 17 families are new records for host plants. No striking effect of this parasitism was noted. On the basis of the findings, it is suggested that there is probably no specificity in regard to the attachment of this parasite on any Colorado species of perennials.

The species concept in *Fusarium* with reference to *Discolor* and other sections, W. C. SNYDER and H. N. HANSEN. (Univ. Calif.). (*Amer. Jour. Bot.*, 32 (1945), No. 10, pp. 657-666).—A partial revision of the genus, involving a reduction in the number of species, has already been proposed (E. S. R., 83, p. 203; 87, p. 70); in the present paper the remainder of the genus is revised in keeping with the species concept adhered to in the previous articles. There are 32 references.

Neutralizing materials for copper sprays, E. R. PARKER, J. T. MIDDLETON, and A. P. VANSELOW. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 31 (1945), No. 2, pp. 56-60).—In the experiments reported, seven Cu-containing materials were selected. $ZnSO_4$ was used as a source of Zn, and Tecmangam was employed as a material containing $MnSO_4$. The effects of these materials, of hydrated lime, and of soda ash, in various proportions, on Cu solubility were determined, and the results are here briefly summarized.

Copper sprays neutralizers, E. R. PARKER, J. T. MIDDLETON, and A. P. VANSELOW. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 25 (1945), No. 12, pp. 10-11, 36).—See also preceding entry.

On the defensive reaction of the plant cell—a contribution to the comparative pharmacology of sulphonamides, V. L. RISCHEKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 47 (1945), No. 7, pp. 520-522, illus. 1).—On the basis of results from germinating tomato seeds on filter paper soaked with a solution of red soluble streptocide (sodium 4-sulfonamido-phenylazo-1-acetyl-amino-8-oxy-3,6-naphthalene-disulfonate), it was found that this substance as a rule accumulated in the root cells in an insoluble state, forming within the protoplasm accumulations of red crystals; this ability to accumulate as crystals proved also to be a function of living cells only. The analogies observed led to the hypothesis that the virus crystals and streptocide crystals are closely related as to mechanism of formation and represent a defense reaction by the plant cell; this reaction consists in the formation of coacervates—believed similar to those recently described by Dufrenoy and Reed (E. S. R., 87, p. 809). The special interest of these findings for the study of viruses lies in the aid they may offer to a better understanding of the conditions for accumulation of virus protein crystals, exemplified by those found in mosaicked tobacco plants.

Tests on the susceptibility and resistance of several southern grasses to the root-knot nematode *Heterodera marioni*, C. W. McBERTH. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 12 (1945), No. 2, pp. 41-44, illus. 1).—The experiments reported involved 18 grasses either commonly grown in or being experimentally tested for adaptability to the Coastal Plain Area of Georgia. Woolly fingergrass and both common and Paraguay Bahia grasses (included in all 3 tests) and Pensacola Bahia grass (1 test) appeared to be highly resistant. Sudan grass, common Bermuda

grass, carpet grass, and corn were most heavily infested. Coastal Bermuda grass and common pearl millet (1 test each) proved entirely free of infestation; on the other hand, common Bermuda grass (2 tests) and pearl millet selection 48-A3 (1 test) were infected, indicating a difference in the resistance of certain strains of grasses to the root-knot nematode.

Accuracy of the local-lesion method for measuring virus activity.—IV, Southern bean mosaic virus, W. C. PRICE (*Amer. Jour. Bot.*, 32 (1945), No. 10, pp. 613-619, illus. 2).—This portion of the investigation (E. S. R., 90, p. 487) discusses a method of measuring the virus of southern bean mosaic which depends on comparing the local lesions induced in Early Golden Cluster bean plants by two dilutions of a virus preparation designated as a standard with those caused by two dilutions of a preparation called an unknown. Several dilution curves of the virus are presented to show why the assumption of a slope of unity leads to error in estimating virus activity, and therefore why two or more dilutions must be employed to determine the slope in each test. The data show that the activity of the virus can be measured with an error rarely exceeding 10 or 15 percent when the proper concentration of the unknown and the standard are chosen for the test. Moreover, it was shown that in experiments carried out by this method the probability is 0.95 that the estimate will not differ from the true value by more than 40 percent on the one hand, or by more than 25 percent on the other, when dilutions are chosen such that the unknown is about 25 percent of the standard in the first case or about 50 percent in the second. The findings also show that the accuracy is apt to be greater when the concentrations of the unknown and the standard differ by only 50 percent than when they differ by 75 percent. Finally, it was shown that the error of measurement is indicated fairly accurately by the standard error of the estimate, which may be calculated from the data.

Stripe smut (*Ustilago striaeformis*) in relation to bluegrass improvement, J. G. LEACH, C. V. LOWTHER, and M. A. RYAN. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 36 (1946), No. 1, pp. 57-72, illus. 5).—When this smut fungus was isolated and cultivated, growth on artificial media proved to be unique in that chlamydospores were formed in abundance. Two distinct types of vegetative growth occurred: In one, colonies with typical radiating mycelium were formed; in the other, growth consisted of curled mycelium breaking up into short fragments. No sporidia were observed; chlamydospores were produced most abundantly by the fragmenting mycelium, although they were eventually produced from typical mycelial colonies. Conventional methods of seed inoculation resulted in low percentages of infection on bluegrass; much better results were obtained by soil inoculation or by injecting chlamydospores hypodermically into the stem near the growing point. Infection from the soil was not confined to the young coleoptile but occurred also on older plants—probably through young tillers. The practicability of inoculating vegetatively propagated clones of bluegrass by the hypodermic needle method was demonstrated; this technic appears to be a promising means of eliminating susceptible clones and identifying resistant ones in a program of selecting or breeding smut-resistant strains of bluegrass.

The internal infection of cotton seed and the loss of viability in storage, C. H. ARNDT. (S. C. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 36 (1946), No. 1, pp. 30-37, illus. 1).—When loss of viability of cotton seeds of less than 14 percent moisture content was indicated by germination tests, negligible proportions of the still viable seeds were infected by micro-organisms and many of the nonviable seeds were not infected; thus micro-organisms were not the primary cause of deterioration. The various types of abnormal seedlings produced indicated that meristem of the primary root was the first portion of the embryo to lose its capacity for indefinite growth during storage, although it usually maintained its capacity for limited growth longer than meristem of the hypocotyl.

Effect of storage conditions on survival of *Colletotrichum gossypii*, C. H. ARNDT. (S. C. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 36 (1946), No. 1, pp. 24-29, illus. 1).—Cotton seeds spontaneously infested by *C. gossypii* and of approximately 8, 10, 12, 14, and 16 percent moisture content were stored at 1°, 21°, and 33° C., as well as at the air temperature of Knoxville, Tenn. The survival of the fungus, as indicated by infection of the seedling progeny, was undiminished after 12 and 17 mo. of storage only on seeds stored at 1°. After 5.5 yr. of storage at 1° the fungus still infected 75 percent of the seedlings developing from seeds stored at 8 percent moisture content. A reduced number of seedlings tended to be infected with each successively higher moisture content up to 16 percent, at which 19 to 27 percent were infected. The fungus tended to lose its ability to infect the seedlings before there was any appreciable loss of viability by the seeds.

Variation and variability of *Fusarium lini*, N. E. BORLAUG (*Minnesota Sta. Tech. Bul.* 168 (1945), pp. 40+, illus. 11).—*F. lini* is composed of a large number of cultural and pathogenic races. The races differ in cultural characteristics, pathogenicity, temperature requirements, and compatibility. Their pathogenicity differs very sharply on certain varieties of flax; a variety may be resistant to one race but completely susceptible to another and vice versa. Several of the South American races were tested, but no one variety was resistant to all races included. Although Koto, Zenith, Bolley Golden C. I. 976, Bison II-33-p45, and Bison II-33-p58 are not classed as resistant, they proved resistant to a larger number of races than other recently introduced varieties tested. Some of the new varieties (e. g., Biwing) that appear resistant in the nursery are actually susceptible to several races as shown by greenhouse inoculations. An antagonistic phenomenon has been observed between two races of *F. lini*; the amount of wilt produced on inoculation with a mixture of two such races is much less than that produced on the same variety by inoculation with either race alone. Inoculation tests with a large number of forms of the group species *F. oxysporum* failed to establish any of these isolates as wilt parasites of flax seedlings. Of 17 crop plants tested in the greenhouse as possible hosts of *F. lini*, all were negative. There appears to be a critical period for infection with *F. lini* if plants are to develop typical wilt; this period is shorter for the more resistant than for susceptible varieties—probably one of the reasons why spread of wilt has not been detected from inoculated to uninoculated rows in the field. Root wounding appears to predispose some varieties to wilt; it has little apparent effect on the reaction of others. There are 24 references.

Treat seed peanuts for profit, S. A. WINGARD and E. T. BATTEN (*Virginia Sta. Bul.* 382 (1945), pp. 11, illus. 1).—Results of seed-treatment tests during 1939-45 show that the stand of peanuts from machine-shelled seed can be greatly improved and that from hand-shelled seed slightly so by treating with such disinfectants as Arasan, Ceresan, Yellow Cuprocide, Dow 9, and U. S. R. 604. On high-vitality hand-shelled seed, the increase from treatment is said to average 5 percent; on low-vitality seed the increase is proportionately greater. Treatment of high-grade machine-shelled seed, on the other hand, increased the stand by 20 to 35 percent and with the low-vitality machine-shelled seed the increase in some cases amounted to 300 percent. High-vitality machine-shelled seed when treated with a good disinfectant will give about as good a stand as untreated hand-shelled seed of the same lot. Detailed recommendations for treating the seed and precautions to be followed are given.

Reactions of Tasmanian Bismark and Brownell potatoes to the commoner virus diseases, J. G. BALD and C. E. W. OLDAKER (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 3, pp. 209-218).—A description—designed for inspectors and field workers—is given of the symptoms induced in these varieties by viruses X, A, Y, and leaf roll. Bismark is unusually resistant to leaf roll but sus-

ceptible to crinkle, due to the combination of viruses X and A. All Brownell plants carry virus X but are field-immune to virus A; they are susceptible to leaf roll—the main cause of degeneration in this variety.

The relationship between necrosis and resistance to virus Y in the potato.—II, Some genetical aspects, E. M. HUTTON (*Jour. Council Sci. and Indus. Res [Austral.], 18 (1945), No. 3, pp. 219-224*)—In this installment (E. S. R., 93, p. 450), the author describes 15 Y-hypersensitive phenotypes, isolated as a result of previously published work, which, as well as those obtained from selected crosses and selfings, can be placed in three definite classes. Of these, it is considered that the local necrotic and top necrotic classes are more valuable than the necrotic collapse class, although all 3 may be of value in the field. Among Australian-grown varieties, Snowflake, Katahdin, and Brown River are apparently more promising than Bismark, Delaware, Factor, and Sebago as a source of Y hypersensitivity. Once hypersensitive types have been selected from hybrid progeny, crosses involving them can produce 10 to 30 percent hypersensitive seedlings. Inheritance of Y hypersensitivity appears to be due to the operation of a recessive allele or alleles, tolerance to the virus being the dominant condition.

Summary of soil fumigant tests made against the golden nematode of potatoes (*Heterodera rostochiensis* Wollenweber), 1942-1944, B. G. CHITWOOD and E. M. BUHRER. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 12 (1945), No. 2, pp. 39-41*).

Een laboratoriummethode voor de bepaling van de vatbaarheid van rogge voor aantasting door het stengelaaftje (*Ditylenchus dipsaci* (Kühn) Filipjev (A laboratory method for determining the degree of susceptibility of rye to infestation by the stem eelworm (*D. dipsaci* (Kühn) Filipjev), J. W. SEINHORST (*Tijdschr. Plantenziekten, 51 (1945), No. 2, pp. 39-52, illus. 3; Eng. abs., p. 51*)—To facilitate studies of the behavior of single plants toward infestation by nematodes in connection with breeding experiments, an inoculation method was developed and tested by which accurate information as to the degree of susceptibility of seedling and older plants has been obtained. Nematodes are collected from infested rye plants by an improved funnel method. A glass tube with a narrow part at one end is connected to the funnel; the nematodes settle in this narrow part. After detaching the tube from the funnel, all the water is removed except a small amount remaining between the nematodes. By filling the tube with fresh water, shaking it, allowing the nematodes to settle again in the narrow part, and removing the excess water, small particles and dissolved substances can be removed from the suspension. The nematodes are then removed to a paraffined dish with as small an amount of water as possible; by replacing the water with 2 percent HgCl_2 satisfactory disinfection of the nematodes is effected without killing them. In ordinary inoculation tests nematodes are removed from these dense suspensions in a droplet of water, a vertical incision is made in the coleoptile of a rye seedling or in the leaf sheath of a tiller on an older plant, and through it the nematodes are introduced. About 100 nematodes per plant proved the best dose for susceptibility tests; temperatures between 8° and 20° C. affected the development of symptoms but slightly and soil and manuring not at all; only young growing plants exhibited symptoms after inoculation. Susceptible and resistant plants could be distinguished quite clearly, both as seedlings and as older plants. Clones could be tested if young tillers were inoculated.

The Argentine curly top of sugar beet, C. W. BENNETT, E. CARSON, G. H. COONS, and E. W. BRANDES. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 72 (1946), No. 1, pp. 19-48, illus. 8*).—The symptoms of Argentine curly top on greenhouse-grown sugar beet and Swiss chard at Washington, D. C., were similar to those on plants with North American curly top. *Eutettis tenellus*—vector of North American curly top—failed, however, to transmit the Argentine virus. In Tucumán, Argentina,

curly top was found on sugar beet, table beet, mangel wurzel, *Physalis* sp., and probably on petunia, but not on tomato. It was transmitted experimentally to sugar beet, chickweed, and zinnia but not to any solanaceous plants, including tomato and tobacco. The symptoms on all infected plants were similar to those produced by North American curly top, but in general were more severe on seedling sugar beets, though recovery from initially induced severe symptoms was much more marked. The sugar beet varieties U. S. 11, U. S. 12, and S. L. 68—resistant to North American curly top—were also resistant to Argentine curly top. R. & G. Old Type and S. L. 842 were highly susceptible to both diseases but less injured by the Argentine disease. *Agalliana ensigera*—vector of Argentine curly top virus—breeds readily on sugar beet and mangel wurzel but not on tomato or tobacco; it feeds on the phloem of sugar beet and leaves a partial sheath of salivary secretion along the line of puncture. Feeding through a membrane of paraffined lens paper, it picked up virus from liquid preparations. The incubation period of the virus in the vector, as found, was 24 to 72 hr.; the virus was not exhausted from viruliferous insects by a 36-day feeding period on an immune plant, but it apparently failed to pass the egg stage of the insect. The thermal inactivation point of the virus appears to lie between 75° and 80° C.; it was not inactivated by a short exposure to 50 percent alcohol. In sugar beet leaves it moved away from the point of introduction at a rate of at least 7.5 cm. per hour. It was carried to 4 of 20 plants by needle inoculation but was not transmitted by the rubbing method. The Argentine virus is tentatively considered to be a variety of the North American curly top virus complex *Ruga verrucosans* and the variety name *distans* is suggested. It is believed that a high level of control in sugar beets can be obtained by using varieties developed in the United States for resistance to the North American form.

Some factors influencing curly top virus concentration in sugar beets, N. J. GIDDINGS. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 1, pp. 38–52, illus. 1).—Nonviruliferous sugar beet leafhoppers were fed for a short time on plants infected with a known virus strain and transferred singly to young sugar beet plants; the resulting percentage infection was considered a measure of virus concentration in the source plant. The results indicated curly top virus concentration to be much greater in infected susceptible than in infected resistant sugar beets. This was true for both a highly virulent and a relatively slightly virulent strain. Curly top virus concentration was much greater in plants infected with the highly virulent than in those infected with the less virulent strain; this was true in both susceptible and resistant sugar beets. The difference in virus concentration was much greater in resistant than in susceptible source plants. Curly top virus concentration was much greater in plants 3 to 12 weeks after infection than in those which had been infected for 3 to 8 mo. This was true when the source plants were infected with either virus strain. The lower virus concentration in resistant sugar beets is a favorable factor, reducing the rate of spread of infection among such varieties. In all groups studied the resistant test plants gave more striking evidence of differences in virus concentration than the susceptible test plants.

Mass action as a factor in sugar-top-virus infection of sugar beet, N. J. GIDDINGS. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 1, pp. 53–56).—The term “mass action,” as here used, is defined as the effect of the varying concentrations of the reacting masses on infection whether or not the reactions involved are reversible. Sugar beet leafhoppers reared on curly top-infected plants and then fed singly on small test plants induced infections among resistant and susceptible test plants in the ratio of 1 : 1.1. When nonviruliferous leafhoppers were fed for 0.5 to 1 hr. on a curly top-diseased plant they transmitted the disease to resistant and susceptible test plants in the ratio of 1 : 2.9. Feeding the nonviruliferous leafhoppers for 3, 9, 15, or 24 hr. on a curly top-infected plant gave transmission ratios

of 1 : 2.4, 1 : 2.1, 1 : 1.7, and 1 : 1.4 for the resistant v. susceptible test plants. This pronounced change in ratio of infections secured among resistant as compared with susceptible test plants is believed evidence that the former require a greater mass of virus than the latter to incite the required reactions resulting in infection. The theoretical and practical implications of mass action in relation to curly top disease are discussed.

Natural replacement of weed hosts of the beet leafhopper as affected by rodents, R. L. PIEMEISEL (*U. S. Dept. Agr. Cir. 739 (1945), pp. 48, illus. 19*).—Previous ecological studies of the natural replacement of weed hosts by grasses and other unsuitable hosts of the beet leafhopper (vector of the curly top virus of sugar beets, beans, tomatoes, and other crop plants) have dealt with the three major destroyers of vegetation—burning, plowing and excessive grazing by livestock; the feeding of rodents is here added as another cause of destruction which may sometimes disrupt plant succession and retard the replacement of weed hosts. The development from the two weed-host stages (Russian-thistle first, then mustards) to the third or annual grass (downy chess) stage took as long as 14 yr. in one plot fenced against livestock but open to jack rabbits, whereas the time was repeatedly shown to be 5 yr. under minimum destruction of vegetation from any cause. When these conditions are fulfilled, the results can be predicted and an optimum (or near optimum) rate of change can be established. If, as present findings indicate, such an optimum rate may also be determined for the stages leading to a reestablishment of native perennials, then there is the possibility of an experimental approach to plant successions involved in revegetation. Assuming conservative grazing by livestock, failure to attain the desired plant cover over a given time and area should prompt a search for harmful destruction of vegetation by rodents or other animals before assigning the failure to some other cause, such as drought or competition.

Fungicidal treatments for improving sugarcane stands, A. McMARTIN (*So. African Sugar Technol. Assoc., Ann. Cong. Proc., 19 (1945), pp. 48–51*).—A previous paper (*E. S. R., 93, p. 451*) referred to the benefits from fungicidal applications to sugarcane cuttings, with special reference to the pineapple disease. The present contribution summarizes the results from the inception of the work to date, sufficient samples being given “to show that this technic is one well worth trying by planters.” Discussion follows the paper.

Internal cork, a new disease of sweet potato of unidentified cause, C. J. NUSBAUM. (*S. C. Expt. Sta.*). (*Phytopathology, 36 (1946), No. 1, pp. 18–23, illus. 2*).—The new disease—characterized by dark corky spots within the roots—was recognized in the spring of 1944; during the harvest season it was widespread but at a low level in South Carolina. The evidence shows that neither a culturable pathogen nor B deficiency are involved, and that the casual agent—as yet undetermined—may be transmitted via diseased roots. A probable correlation between the occurrence of a ring-spot symptom on the older leaves of affected plants and the development of corky roots was indicated, and the possibility that the disease may be of a virus nature is suggested.

[Plant disease work at the Tobacco Substation at Windsor, 1944], P. J. ANDERSON (*Connecticut [New Haven] Sta. Bul. 487 (1945), pp. 291–296*).—The seasonal tobacco disease situation and work on control of early damping-off in seedbeds are summarized.

Blue mold control in tobacco beds, E. E. CLAYTON. (*Coop. Ga. Coastal Plain, S. C., N. C., Tenn., and Md. Expt. Stas. et al.*). (*U. S. Dept. Agr., 1945, AIS-37, pp. [8], illus. 5*).—An informative leaflet.

Experiments on the use of vegetable seed protectants, C. N. CLAYTON and C. J. NUSBAUM. (*Coop. U. S. D. A.*). (*South Carolina Sta. Bul. 361 (1945), pp. 24, illus. 4*).—On the basis of the results of tests here described and those

obtained by workers in other States, recommendations are presented in tabular form for lima and snap beans, beets, cantaloup and cucumber, lettuce, okra, paprika, market and garden peas, edible soybeans, spinach, sweet corn, and watermelon.

The control of celery leaf-spot in commercial nurseries, L. L. STUBBS (*Jour. Dept. Agr. Victoria*, 43 (1945), No. 12, pp. 512-516, illus. 4).—Celery leaf spot or late blight (*Septoria apii-graveolentis*) is reported to be serious in Victoria, being particularly prevalent in commercially grown greenhouse seedlings. The results of an experiment in a commercial nursery indicated three methods of treatment (HgCl₂ and hot water at two temperatures) to be equally effective in eradicating the fungus from infected seed. The hot water method (118° F. for 30 min.) proved most effective for treating seed in bulk. During three seasons this method has completely controlled leaf spot on seedlings grown in a commercial nursery.

The rust of greenhouse-grown spearmint and its control, J. S. NIEDERHAUSER ([*New York*] *Cornell Sta. Mem.* 263 (1945), pp. 30, illus. 6).—*Puccinia menthae* occurs as a pathogen on a large number of wild and cultivated members of the mint family throughout the world. When spearmint is grown in greenhouses during winter this rust disease is often the limiting factor in producing salable shoots; in commercial fields where grown for its aromatic oils the disease may also become a serious problem. This investigation—begun in 1940—concerns the morphology and habits of cultivated spearmint, culture practices, susceptibles (48 known species in 9 genera of the Labiatae), the disease (names, history, range, economic importance, symptoms, cause, and epidemiology), and its control by exclusion, eradication, protection, and immunization. The author has repeatedly obtained infection on spearmint using aeciospores, urediospores, or basidiospores; single aeciospores and urediospores have likewise given rise to typical uredial lesions. The fungus was shown to consist of at least several pathogenic races; in the tests reported, infection resulted only when the inoculum came from the same species or clone of mint that was inoculated. The life history and pathogenesis of *P. menthae* are presented in some detail. From the practical standpoint, an extensive program to develop a rust-immune spearmint might be feasible when it is grown as a field crop; for greenhouse culture, however, the scale of production and the convenient exclusion methods of control would appear to render such an approach unprofitable. There are 25 references.

Tatter leaf of sweet cherry, R. S. WILLISON and G. H. BERKELEY (*Phytopathology*, 36 (1946), No. 1, pp. 73-84, illus. 2).—This is a virus disease observed in several orchards of the Niagara Peninsula. One strain of the virus was transmitted to a range of differential hosts including peach, plum, and sweet and sour cherries. In the spring after inoculation the leaves of Black Tartarian cherries were marked with fine brown lines delimiting interveinal areas, later becoming necrotic and dropping out; faint yellowish mottling and oak-leaf patterns also occur. Leaves formed later in the season appeared normal. Symptoms were more intense and more widely distributed after inoculation early in the growing season than after fall inoculation. Necrosis and laceration affected Napoleon to a lesser, and Bing to a greater, degree than Black Tartarian cherries. On plum varieties, some early leaves were indistinctly mottled. On peach, acute symptoms such as superficial bark necrosis, ring patterns, and chlorotic markings appeared during the first season. Chronic symptoms such as faint mosaic and oak-leaf patterns, dullness, and premature aging of the upper leaf surface, red pin-spotting, and occasional fawn necroses developed during the second and subsequent years after infection. Acute foliar symptoms were suppressed in favor of chronic symptoms on inoculated yearling seedlings cut back to the bud in spring. On the Montmorency cherry, fine etched rings and necrotic spotting were the acute phase and undulation, rugosity, and twisting of leaf laminae the chronic phase.

Peach mosaic in Utah, B. L. RICHARDS and A. S. RHODES. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 4, pp. 5-6, 12-13, illus. 5).—The authors present a general informatory account of this virus disease with particular reference to Utah, including its occurrence and economic importance in the State, symptoms, transmission and spread of the virus, differences in symptom expression among peach varieties, hosts, and control.

Carnation wilt diseases and their control, E. F. GUBA (*Massachusetts Sta. Bul.* 427 (1945), pp. 64, illus. 14).—The culture of carnations in greenhouses represents a large industry in Massachusetts; concentrated within a radius of 40 miles of Boston, about 26 million or more cut flowers are produced in that area and sent as far as Florida, Illinois, and Missouri. Serious losses from disease led to this investigation, the results of which are arranged essentially into sections conforming to the various stages or practices in carnation culture; besides the findings from this study, it seemed desirable to include also the offerings of earlier investigators (84 references), especially those from the United States and England. The important diseases in the State are spot, blight, and cankers (*Alternaria dianthi*); root, crown, or foot rot (species of *Fusarium*, including *F. culmorum* and *F. avenaceum*); branch rot or wilt (*F. dianthi*); and stem rot (*Rhizoctonia solani*). Distinctive symptoms are associated with each, though wilting is common to all; these are all described in detail, along with the factors influencing infection and methods of control.

Incidence of disease in the cuttings and in young stock after rooting is intimately associated either with infection latent in the cutting or with superficial spore inoculum. Use of clean sand after each crop of rooted cuttings and a clean smooth cut leaving no loose remnants of tissue are preferred in relation to control. Immersion of cuttings for 15 min. in 1-1,000 potassium permanganate solution (0.25 oz. to 2 gal.) encourages rooting and provides some disinfection of superficial inoculum; this was the most effective chemical used in the tests, but powdering the base of cuttings with 10 percent Fermate or Arasan dusts gave good control of *F. dianthi* without harmful action. All-year culture in the greenhouse proved effective in controlling alternaria blight. Care in lifting and transplanting and general sanitation are also important for disease control. Infection and the advance of wilt are favored by excessive or overhead watering, warm greenhouses, and stagnant moist air. Setting the plants deeper than the roots encourages *Rhizoctonia*. Fumigation with naphthalene base materials against red spider mite proved notably better than spraying with strong sprays of water. Entire flats of young plants or classes of stock should be discarded when there is a progressive loss from disease; segregation of young plants from flowering stock is also desirable. Distinct contrasts in susceptibility of varieties to *A. dianthi* and *F. dianthi* were shown. Soil sterilization with heat or chemicals is reviewed with respect to both disease and weed control; sterilization of potting and flating soil by any acceptable method is very desirable. Powdered naphthalene, copper compounds, and calcium arsenate proved lethal to *A. dianthi* spores; lead arsenate, lime, and sulfur materials did not. Good control of alternaria blight was obtained in small-scale tests with bordeaux plus calcium arsenate and fish oil, as well as with dusting mixtures containing naphthalene, calcium arsenate, monohydrated copper sulfate, or lime. In epidemic years, significant control of blight in the field was shown by 4-4-50 bordeaux combined with 1 lb. calcium arsenate and 0.5 pt. Penetrol; calcium arsenate alone proved injurious, and dusting materials gave poor control. Satisfactory results from spraying required frequent treatments with a power sprayer beginning after the plants were fielded in May and continuing to benching time in the greenhouse, or early June. Spraying is recommended for susceptible varieties, but only where field culture is practiced.

De bladrandchlorose van Rhododendron catawbiense "Grandiflorum" [The leaf-margin chlorosis of *R. catawbiense*, *Grandiflorum* variety], W. A. NIEUW-

DORP (*Wageningen, [Netherlands]: H. Veenman & Sons, 1945, pp. 180+*, *illus. 44; Eng., Ger., Fr. abs., pp. 153-167*).—In this chlorosis—the subject of a doctorate thesis—the most striking above-ground symptom is a yellowish-vermilion-green discoloration along the leaf margins and between the veins of the first order about half way to the midrib appearing about July and later passing over to a cadmium yellow. The chlorophyll content of affected leaves averaged only 44 percent of the chlorophyll in sound leaves. Below ground a defective root-hair formation was observed. The disease is reported to be of some economic importance in the Boskoop area, southern Netherlands, where the shrub is grown on a peat-clay soil. Preliminary study suggested that the cause lay in the soil, and especially in the Ca : H ratio. Controlled pot experiments confirmed this relation; the best plants developed in the absence of Ca, and the chlorosis in no way corresponded with the symptoms of deficiencies in K, Mg, or P, but appeared due directly to a shortage of N. The plant may be expected to develop best in poor acid soils that are moist but porous. In the affected soils considerable lime had been used. The situation was remedied by adding acid or acid-forming chemical materials to the soil. In the experiments reported, limited quantities of sulfur applied to soils with insufficient acidity have exerted a favorable influence.

Phloem necrosis, a destructive disease of the American elm, C. M. TUCKER (*Missouri Sta. Cir. 305 (1945), pp. 15, illus. 8*).—Phloem necrosis is widely distributed in several Midwestern States; it occurs in all geographic areas of Missouri and was observed in epidemic form in some parts during 1944-45. Varieties of the American elm have proved susceptible; other species tested, resistant. Transmission of the virus is believed to be through leaf-sucking insects and by spontaneous root grafting. Affected elms may be identified by the yellowing falling leaves and more definitely by a yellow discoloration and wintergreen odor in a thin layer of inner bark in contact with the wood. Infected elms invariably die within a short time; they should be removed as early as possible. The effectiveness of eradication and insecticide studies under way cannot be judged until after several years of observations; until resistant strains become available it is recommended that other trees be substituted for home, park, and street planting in Missouri. Nursery elms from affected areas may introduce the disease into new areas and serve as centers of spread.

Helicotylenchus, a new genus of plant-parasitic nematodes and its relationship to Rotylenchus Filipjev, G. STEINER. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 12 (1945), No. 2, pp. 34-38, illus. 1*).—*H. nanus* n. gen. and sp. (Tylenchinae) are described. This species was first observed on lima bean roots; later it was found repeatedly on roots of a number of plants. It is now known to occur through all the Southeastern States. Some general remarks on the group are included.

Ditylenchus destructor n. sp., the potato rot nematode, and Ditylenchus dipsaci (Kühn 1857) Filipjev 1936, the teasel nematode (Nematoda: Tylenchidae), G. THORNE. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 12 (1945), No. 2, pp. 27-34, illus. 3*).—The nature of the infection in potato and the causal nematode *D. destructor* are described, and the "potato-rot nematode" is suggested as a common name. The diagnosis of *D. dipsaci* is amended and it is here referred to as the teasel nematode, since preliminary studies indicated that with further research it will be possible definitely to separate other forms of the commonly called "bulb or stem nematode." Varieties of *D. dipsaci* previously established are listed.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Water requirements of desert animals in the Southwest, C. T. VORHIES (*Arizona Sta. Tech. Bul. 107 (1945), pp. 485-525, illus. 13*).—The microclimates of

selected desert mammals under the same general environment were investigated via soil thermographs and hygrothermographs, supplemented by rain gages, thermometers, and the psychrometer, and their food habits were correlated with habitat and microclimate. The kangaroo rat (*Dipodomys spectabilis*) eats mostly air-dry food, mainly seeds, with a minimum water content, yet it seldom if ever takes free water; its deep burrowing and nocturnal habits and its physiology conserve water. The wood rat (*Neotoma albigula*) does not drink but uses more succulent food; it is less strictly nocturnal than *Dipodomys* and lives in a shallower and less well-protected burrow. The round-tailed ground squirrel (*Citellus tereticaudus*) uses much succulent food and drinks water when available; its diurnal habit requires more moisture, which is partially compensated for by a deep burrow into which it may retreat during the hottest hours and in which it lies dormant through the fall drought. Jack rabbits (*Lepus* spp.) are mainly nocturnal but have no such shelter as a burrow against heat and desiccation by day. Only under most unusual circumstances do they drink—perhaps never in their normal existence. The more they need water, the less likely is it to be available. Their food is highly succulent, mainly mesquite and cactus, with the latter increasingly consumed as drought conditions increase. A comparison of the climate of the mesquite forest with the adjacent desert mesa shows a less extreme climate in the forest—especially as to atmospheric humidity and soil-surface temperature. Nevertheless, more mammals—both as to species and individuals—live in the desert; this is especially true of the Heteromyidae, the kangaroo rats and pocket mice.

A note on the natural occurrence of fluoroacetic acid, the acid of the new rodenticide "1080," C. W. KLINGENSMITH (*Science*, 102 (1945), No. 2659, pp. 622–623).—It is considered of much interest that the substance responsible for the toxicity of 1080 (= sodium fluoroacetate) has been isolated from a plant source—*Dichapetalum* (*Chaetelia*) *cynosum* and *C. toxicaria*.

Bird distribution and ecological concepts—a symposium directed by V. E. Shelford, pts. 2–6 (*Wilson Bul.*, 57 (1945), No. 4, pp. 243–252, illus. 1).—In continuation of this symposium (*E. S. R.*, 94, p. 219), brief summaries of the following papers are presented: Birds of a Deciduous Forest Aquatic Succession, by J. W. Aldrich (pp. 243–245); Birds of the Deciduous Forest, by J. J. Hickey (pp. 245–246); Grassland Birds, by O. A. Stevens (p. 247) (*N. Dak. Expt. Sta.*); Coniferous Forest Birds, by R. T. Peterson (pp. 247–248); and The Relative Merits of the Life Zone and Biome Concepts, by V. E. Shelford (pp. 248–252) (*Univ. Ill.*).

Winter night habits of birds, A. D. MOORE (*Wilson Bul.*, 57 (1945), No. 4, pp. 253–260).—The author discusses heat production, temperature regulation, and heat loss mechanisms in birds, enclosed and open roosts, and the technics of observing, recording, and reporting.

L'alimentation hivernale de la gélinotte a fraise, *Bonasa umbellus togata* L., dans la région de Montréal [The winter foods of the ruffed grouse *B. umbellus togata* L. in the Montreal Province of Quebec], L. PHILIPPE (*Nat. Canad.*, 72 (1945), No. 9–10, pp. 235–240; *Eng. abs.*, p. 240).—A study of the food plants based on analyses of fecal dejecta, including a tabulation of the relative importance of 6 plant parts of some 14 species.

The fishes of Clear Lake, Iowa, R. M. BAILEY and H. M. HARRISON, JR. (*Iowa Expt. Sta. et al.*). (*Iowa State Col. Jour. Sci.*, 20 (1945), No. 1, pp. 57–77, illus. 1).—In this contribution the authors describe the lake, discuss ecological and management considerations, briefly summarize the history of fish surveys and stocking therein and the methods used, and present an annotated list of the 43 species of fishes that have been collected in the lake.

[Notes on insects and insecticides] (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 597–620, illus. 8).—Contributions presented (*E. S. R.*, 94, p. 220) are The Bloodsucking Habits and Growth of Nymphs of *Triatoma gerstaeckeri* (p. 597) and The Biology

of *Triatoma gerstaeckeri* (pp. 597-598), both by D. C. Thurman, Jr.; Insecticides for Control of the Cotton Flea Hopper, by L. C. Fife, A. J. Chapman, and R. L. McGarr (pp. 598-599) (U. S. D. A. coop. Tex. Expt. Sta.); Effect of Ferric Dimethyl Dithiocarbamate on Emergence of Tobacco Flea Beetles from Plant-Bed Soil, by J. U. Gilmore, C. Levin, and T. E. Smith (pp. 599-600) (U. S. D. A.); DDT for Control of the Grape Bud Beetle [*Glyptosticella squamulata* Crotch], by W. Ebeling (p. 600) (Calif. Citrus Sta.); Flea Collections at Army Installations in the Fourth Service Command, by S. J. Carpenter, R. W. Chamberlain, and R. Baker (pp. 600-602); Control of Housefly Breeding in Partly Digested Sewage Sludge, by T. A. Olson and R. G. Dahms (pp. 602-604); Thanite as a Control for Ants, by R. H. Smith (p. 604) (Univ. Calif.); Duplicating Japanese Beetle Injury in Field Corn, by B. F. Coon (pp. 604-605) (Pa. Sta.); Factors Inducing Diapause in the Oriental Fruit Moth, by R. C. Dickson and E. Sanders (pp. 605-606) (Calif. Citrus Sta.); DDT and Bedbugs in Chicken Houses, by W. M. Kulash and J. M. Maxwell (p. 606) (N. C. Sta.); The Effect on the Fingers of the Poison of *Formica exsectoides*, by E. E. Haviland (p. 607); DDT and Lead Arsenate Compared for Control of the Pecan Nut Casebearer, by C. B. Nickels and W. C. Pierce (p. 607), and DDT Residual Spray Tests in Panama, by A. W. Lindquist and W. C. McDuffie (p. 608) (both U. S. D. A.); DDT for Control of the Onion Thrips, by A. J. Chapman, L. C. Fife, and R. L. McGarr (pp. 608-609) (U. S. D. A. coop. Tex. Sta.); DDT and "Control" of Honeybees, by W. M. Kulash (pp. 609-610) (N. C. Sta.); Methyl Bromide for Control of the Pineapple Mealybug, by M. R. Osburn (p. 610) (U. S. D. A.); Dusting for Cattle Lice, by C. Lyle and R. G. Strong (pp. 611-612) [Miss. Sta.]; DDT for the Control of Goat Lice, by H. E. Parish and C. S. Rude (pp. 612-613) (U. S. D. A.); Mosquitoes of Northwest Florida, by G. A. Edwards and E. V. Porter (pp. 613-615); DDT for the Tent Caterpillar, by J. A. Manter (p. 615) (Univ. Conn.); Soil Nitrogen and Thrips Injury on Spinach, by S. H. Wittwer and L. Haseman (pp. 615-617) (Mo. Sta.); Sorption of HCN by Insect Pupae, by D. L. Lindgren and W. B. Sinclair (p. 617) (Calif. Citrus Sta.); (A New Leafhopper [*Cicadella stellulata* (Burm.)] on Cherry, by S. W. Frost (pp. 617-618) (Pa. State Col.); DDT-Like Effects From Injection of Other Compounds Into Roaches, by S. C. Munson and J. F. Yeager (p. 618) (U. S. D. A.); The Toxic Gases of Lime-Sulfur, by C. E. Abbott (pp. 618-620); and An Unusual Habit of the Pecan Budmoth in Florida, by A. M. Phillips (p. 620) (U. S. D. A. coop. Fla. Sta.).

Entomology in Holland during the war, B. J. LEMPKE (*Ent. Rec. and Jour. Variation*, 57 (1945), No. 12, pp. 133-134).

Effects of the reflected solar radiation on insects, O. QUERCI and L. ROMEI (*Fla. Ent.*, 28 (1945), Nos. 1, pp. 20-21; 2, pp. 36-38).—Miscellaneous observations are made leading to the conclusion that radiations reflected from the ground are an important factor in climate and in their effects on insects.

The transport of insects in aircraft, V. G. DETHIER (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 528-531).—This study gave no indication that aerial insect fauna enter aircraft during flight; air flow and slip stream are such that most of them are directed away from the plane. On the ground, the majority of species are found in the cabin; because of the lesser opportunities for insects to enter and survive in wing and tail spaces these are believed of minor importance in control programs. On the basis of collections in Africa, it is concluded that practically any species may be found in the cabin; this is the chief concern in control. The immediate determining factors are abundance of any species around air strips—which varies with the season—and the behavior of the insects themselves. The occurrence of insects in planes may be reduced by maintaining a so-called "sanitized" airport and by parking planes away from the edges of jungles, fields, and water courses. An example is given of one airfield where effective sanitation caused a reduction of

anophelines in planes to a point at which none was found over an 18-mo. period. Along the route studied it proved necessary to control the cabin only. Standard procedures involving proper use of aerosol bombs were effective and adequate.

A potometer for rapid measurements of ingestion by haustellate insects. M. R. and H. FRINGS (*Science*, 103 (1946), No. 2662, pp. 22-23, illus. 2).—In a study of the nutrition of the blowfly *Cynomyopsis cadaverina* it became necessary to measure accurately the amounts of ingested food. To facilitate these measurements a potometer was developed—and is here described and illustrated—which, besides its utility in these studies, should prove a useful tool for rapidly measuring ingestion in assaying insecticidal toxicity. With suitable modifications, it could easily be adapted to use with haustellate insects other than flies.

Black fly incubator-aerator cabinet. L. J. THOMAS. (Univ. Ill. et al.). (*Science*, 103 (1946), No. 2662, p. 21, illus. 1).—Vegetation covered with eggs, larvae, and pupae of blackflies is collected from a stream, brought to the laboratory in minnow buckets half filled with water from the stream, and placed in the shallow compartments formed by baffles in the cabinet here described and illustrated. Within a day or two most of the larvae are attached to the baffles. The canvas on the bottom of the cabinet is tacked near the drain so that it is constantly soaked with water; evaporation up the sides serves to cool the interior. The apparatus is said to work equally well for chironomids, caddis flies, and other rapids-inhibiting insects.

Insect pathology and biological control. E. A. STEINHAUS. (Univ. Calif.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 591-596).—Although the term biological control first suggests the use of certain insects which parasitize and usually destroy other insects, the author in this address emphasizes a few general aspects of another important type of biological control, viz, that brought about by the natural and artificial use of parasitic and disease-producing micro-organisms, including bacteria, fungi, protozoa, and viruses. "What is urgently needed is the sympathetic, moral, and financial support of basic research into the various biological relationships existing between insects and micro-organisms and into the many factors concerned in the spread of diseases among insects in the field. . . . Having this foundation, then and only then can we build a structure of broad and practical usefulness to man in his efforts to control the insect pests which plague him and his world."

Continuous anesthesia for insects. C. M. WILLIAMS (*Science*, 103 (1946), No. 2663, p. 57, illus. 1).—The technic described and illustrated has been used routinely on a sufficient array of insect species to demonstrate its general utility; it has also been employed with success at a number of other laboratories. The only requirements are a Buchner funnel of suitable size and a tank of CO₂. The operations are performed in the open depression of the funnel, through the bottom of which passes a slow stream of gas from the cylinder. Being heavier than air, the CO₂ persists in the mouth of the funnel, making a lid unnecessary. Any depth of anesthesia can be established and maintained merely by adjusting the rate of gas flow.

Über Konstitution und toxische Wirkung von natürlichen und neue synthetischen insektentötenden Stoffen [The chemical constitution and toxic effect of the natural insecticides and the new synthetics], P. LAUGER, H. MARTIN, and P. MÜLLER (*Helvetica Chim. Acta*, 27 (1944), No. 4, pp. 892-938, illus. 12).

Insecticide research: A review of the constitution and the toxic effect of botanical and new synthetic insecticides. E. G. THOMSEN (*Soap and Sanit. Chem.*, 21 (1945), No. 9, pp. 121, 123, 147).—A review of the preceding entry.

DDT to control ticks on vegetation. C. N. SMITH and H. K. GOUCK. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 553-555).—A commercial grade of soluble pine oil proved satisfactory as solvent and emulsifier for DDT in preparing sprays for tick control. Sprays containing technical grade DDT dissolved in this oil and emulsified in water were excellent against nymphs and adults of the lone

star tick in woodland plots when applied at the rate of 1 lb. DDT per acre; at 6 oz. per acre control was less complete but still highly satisfactory, reductions of nymphs and adults being apparent for 68 and 53 days, respectively; at 5 oz. DDT per acre the control was less complete. Dust containing DDT in pyrophyllite was effective at 3 lb. but not at 4 and 5 oz. of DDT per acre. Sprays and dusts containing DDT also gave excellent control of adults of the American dog tick when applied at 9, 7, or 3 lb. of DDT per acre.

Quarterly bibliography on insecticide materials of vegetable origin, No. 31 (April to June 1945), R. M. JOHNSON (*Bul. Imp. Inst. [London]*, 43 (1945), No. 3, pp. 219-224).—A continuation of this bibliography (E. S. R., 94, p. 497).

Pyrethrum flowers—supplement to second edition, 1936-1945, C. B. GNADINGER (Minneapolis, Minn.: McLaughlin Gormley King Co., 1945, 2. ed., sup., pp. 381-690+, illus. 40).—The first edition has been noted (E. S. R., 70, p. 650). Since the second edition⁴ appeared, new sources of supply have been developed, and technical improvements have greatly increased the uses of pyrethrum insecticides; the new material accumulated during the past 9 yr. has been collected in this volume as a supplement. The index to this supplement includes a completely revised index to the second edition; the pagination of the supplement is continuous with that of the second edition. More than 1,300 literature references are included in the supplement; these also are numbered continuously.

Some X-ray crystallographic data on DDT, I. FANKUCHEN, M. SCHNEIDER, and J. SINGER (*Science*, 103 (1946), No. 2662, p. 25).

Preliminary tests with DDT against insect pests of food crops in the Lesser Antilles, R. G. FENNAH (*Trop. Agr. [Trinidad]*, 22 (1945), No. 12, pp. 222-226).

Transmission of the toxicity of DDT through the milk of white rats and goats, H. S. TELFORD and J. E. GUTHRIE (*Science*, 102 (1945), No. 2660, p. 647).—The preliminary feeding tests reported show that with continued oral administration of DDT to goats and rats there is eliminated in their milk a toxic substance producing symptoms indistinguishable from DDT intoxication. The findings strongly suggest the need for more intensive research on the toxicity of milk from dairy cows ingesting DDT residues either from sprayed or dusted forage plants or from licking themselves after being treated with this insecticide.

Biochemical differences between the solitary and gregarious phases of locusts and noctuids, J. J. MATTHEE (*Bul. Ent. Res.*, 36 (1945), No. 3, pp. 343-371).—The lactic acid concentration of the whole body expressed in milligrams per gram of wet body weight was found to vary from 0.1541 in the final instar solitaria larvae of *Spodoptera abyssinica* Guen. to 0.9461 in the gregaria pupae of *Laphygma eximpta* (Walk.). No attempt was made to measure the degree of activity, but it was noted that the larvae of *L. eximpta* were more active than those of *S. abyssinica*. Since the production of lactic acid depends on the degree of activity, the conclusion seems warranted that *L. eximpta* larvae were more active than those of *S. abyssinica*. A comparison of the lactic acid concentration of the two species of acridids also appeared to show that *Locustana pardalina* (Walk.) was more active than *Locusta migratoria migratorioides* R. & F. In the species and stages compared, a higher lactic acid concentration was found in phase gregaria than in phase solitaria—with *Locustana pardalina* as the only exception. Evidently, then, gregaria must have been more active than solitaria. In *L. pardalina*, where field hoppers were used, a higher lactic acid concentration was found in the solitary than in the gregaria phase; this is difficult to explain.

The uric acid content of the blood of the four species varied from 14.36 mg. percent in gregaria hoppers of *Locusta migratoria* to 51.11 in the solitaria larvae

⁴Pyrethrum flowers, C. B. Gnadinger. Minneapolis, Minn.: McLaughlin Gormley King Co., 1936, 2. ed., pp. 380+, illus. 53.

of *Laphygma exempta*. The uric acid concentration of the solitaria individuals of *S. abyssinia*, *Locusta migratoria*, and *Locustana pardalina* varied from 20.17 mg. percent in the first to 21.22 in the second, while in gregaria individuals it varied from 13.36 in *Locusta migratoria* to 14.12 in *S. abyssinia*; thus the concentration in these three species did not vary appreciably. In the larval blood of *Laphygma exempta*, on the other hand, the concentration of uric acid was exceptionally high—in the solitary phase 51.11 mg. percent and in the gregaria phase 46.91. The uric acid values for the phase solitaria were consistently higher than for the phase gregaria.

The percentage of fat varied from 11.11 in the solitaria hoppers of *Locusta migratoria* to 42.93 in the gregaria larvae of *S. abyssinia*; in contrast with the uric acid values, the gregaria phase yielded consistently more fat than the solitaria phase. The blood of *L. migratoria* had a slight acid reaction, while that of *Laphygma exempta* was on the alkaline side; in both species the blood of the gregaria had a greater acidity than that of the solitaria phase. The moisture percentage varied from 72.25 in the solitaria pupae of *S. abyssinia* to 91.13 in the solitaria larvae of *L. exempta*. Differences worthy of mention were found only between the solitaria and gregaria phases of *L. exempta* and *Locustana pardalina*; in these cases the solitary phase yielded a higher percentage of moisture than the gregaria phase. There are 23 references.

The identification of nymphal Melanopli in Manitoba and adjacent areas, R. H. HANDFORD (*Minn. Univ., Sum. Ph. D. Theses, 2 (1943), pp. 56-58*).—This study concerns 21 species of the grasshopper genus *Melanoplus*, 18 of which are said to occur in Manitoba.

On the ability of the caterpillars of the milkweed-moth *Euchaetias egle* Drury to land on the feet after falling, H. FRINGS (*Amer. Midland Nat., 34 (1945), No. 3, pp. 662-672, illus. 5*).—A contribution showing the mechanism by which these larvae land on their feet when falling.

Experimental starvation of first-instar larvae of the pale western cutworm (*Agrotis orthogonia* Morr.), R. W. SALT and H. L. SEAMANS (*Canad. Ent., 77 (1945), No. 8, pp. 150-155; illus. 1*).—The experimental evidence given indicates the first-instar larvae to be less resistant when fed before being starved than when not. At 13° C., the first of the larvae starved from the time of hatching died on the eighth day, and by the seventeenth day a maximum mortality of 46.3 percent was reached. The first of those fed 5 days before starving died on the eighth day also, but reached a maximum mortality of 77.9 percent on the fifteenth day. At alternating temperatures of 18 hr. at 8° and 6 hr. at 21°, the first of the larvae starved from hatching time died on the seventh day and by the fourteenth day a mortality of 54.8 percent had been suffered; this was increased to 61 percent by the twenty-fourth day. The first of the larvae fed 5 days before starving died on the sixth day, and a maximum mortality of 85.4 percent was reached on the fourteenth day. It was determined that the increased mortality in the two series fed 5 days before being starved was because these larvae could not resume feeding; those starved from the time of hatching could start feeding whenever food was supplied. A digestive disturbance is suspected, since larvae in the pre-fed series bloated in the fore part of the body during the starvation period. Moisture plays a prominent role during a starvation period. A series starved dry at 13° suffered a 46.3 percent mortality; a duplicate series supplied with moist blotting paper died to the extent of 87.8 percent, almost exactly duplicating a series fed before starving.

A monograph of the genus *Corythaica* Stål (Hemiptera: Tingidae), M. P. HURD (*Iowa State Col. Jour. Sci., 20 (1945), No. 1, pp. 79-99, illus. 13*).—The author's revision of this genus of the lace bug family includes a key to the species. The genus is limited to the Western Hemisphere, with four species in North America.

Notes on the genus *Cryptostemma* with a new record for Georgia and a new species from Puerto Rico (Hemiptera: Cryptostemmatidae), R. L. USINGER. (Univ. Calif.). (*Ent. News*, 56 (1945), No. 9, pp. 238-241).

Three new western Dolichopodidae, F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Canad. Ent.*, 77 (1945), No. 8, pp. 137-139).—Three new species of flies from the western United States are described.

Further observations on the Psyllidae of Cuba (Homoptera), L. D. TUTHILL. (Iowa State Col.). (*Ent. News*, 56 (1945), No. 9, pp. 235-238).—This contribution (E. S. R., 91, p. 712) on seven Cuban psyllids includes descriptions of *Platycorypha princeps* n. gen. and sp.

Synoptic revision of the United States scarab beetles of the subfamily Dynastinae.—I, Tribe Cyclocephalini, L. W. SAYLOR (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 12, pp. 378-386, illus. 1).

Taxonomic studies of Nearctic Cryptini (Ichneumonidae: Hymenoptera), H. D. PRATT. (Minn. Expt. Sta.). (*Amer. Midland Nat.*, 34 (1945), No. 3, pp. 549-661, illus. 120).—This monograph contains a generic key to the tribe Cryptini, a key and descriptions of the Nearctic species of *Cryptus*, a description of the new genus *Nasutocryptus*, and a bibliography of the literature (10.5 pages) on the members of the Nearctic tribe. A brief study was made of the larvae of at least 1 species in 19 of the 31 Nearctic genera. Head structures of the larvae of 19 genera and the chaetotaxy of the larvae in 16 genera are figured to illustrate the provisional synopsis of the larvae. A historical account of the tribe is also included.

The development of artificially introduced infestations of *Aphidius granarius* Marsh. under field conditions, D. R. ARTHUR (*Bul. Ent. Res.*, 36 (1945), No. 3, pp. 291-295, illus. 2).—The aim of the present work was to determine the degree of control likely to be achieved by introducing this braconid parasite into corn crops known to harbor heavy aphid infestations but to lack the corresponding parasitism. The tests reported show that the parasite can be successfully established. It would appear that the only method of inducing it to produce the desired effect on the host by artificial introduction will depend on the management of breeding cages from which initial flights of *A. granarius* take place. From the demonstrations reported, it would seem that this is most effectively done by concentrating the cages in the middle of the field. This bears a direct relation to the meteorological conditions governing the flight periods of the adult parasite, as this portion of the field will receive automatically the greatest intensity of heat for the longest period of the day and will also have a minimum of shade conditions. Further, the location of the cages will provide a ready nucleus from which divergence in all directions, without restrictive barriers, will be possible.

Preliminary studies on starvation of first instar European corn borer larvae (*Pyrausta nubilalis*), O. E. TAUBER and W. N. BRUCE. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 20 (1945), No. 1, pp. 53-55, illus. 1).—Dehydration of the larvae is believed to account for the shorter survival periods observed at the lower relative humidities—possibly below 80 percent. The longevity of starved larvae varied directly with humidity and inversely with temperature; these relationships held at all combinations used. The true starvation periods were probably those uncomplicated by dehydration and cannibalism, meaning that the true starvation periods were likely to be found in an atmosphere saturated with water and at 50° to 80° F. In the field, conditions for maximum survival of newly hatched borers would be at a high relative humidity and a temperature high enough to permit activities necessary for dispersal, migration, and feeding. Since the activity increased and the longevity decreased with temperature, 70°-90° at a high relative humidity (above 80 percent) would seem to be ideal for establishing newly hatched larvae in the corn plant. At higher temperatures, in drier air, the chances for survival are considerably decreased.

The largest egg mass counted in these experiments was one with 149 eggs; the average number per cluster was 3478.

Further observations on host plants of the pink bollworm in the lower Rio Grande Valley of Texas and Mexico, A. J. CHAPMAN and I. MORENO (U. S. D. A. coop. Tex. Expt. Sta. et al.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 583-584).—Observations on secondary host plants were continued through 1943-44 (E. S. R., 89, p. 706). A few among large collections of wild mallow plants held for later examination carried resting-stage larvae of the pink bollworm which emerged in February and March, indicating that this host plant might serve as a source of infestation to cotton. A heavier infestation than previously observed was found on okra. A considerable number of larvae were likewise found on a large collection of another mallow (*Pseudobutylon losani*), and it was definitely proved that the pink bollworm developing on this host can transfer to cotton. One mature larva was found on green and dry seed pods of *Hibiscus cardiophyllus*—a new record for the Rio Grande Valley. *H. mutabilis* and *Malvastrum arborous* were also recently found as secondary hosts. Many negative results from examining the mallows discussed and other potential wild and cultivated hosts were obtained but are not reported here. Infestation of secondary host plants depends on the intensity of infestation in cotton, their proximity to cotton fields, and the time of year when these hosts fruit. The most favorable time for infestation of secondary hosts is the fall. The importance of these plants in maintaining infestations in the area under study has not yet been established.

DDT for bollworm control during 1944, E. E. IVY, C. R. PARENIA, JR., R. W. MORELAND, and K. P. EWING. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 534-536).—In cage tests with third-instar bollworms, 4 and 2 percent DDT proved more effective and 1 and 0.5 percent less so—each at 16 lb. per acre—than calcium arsenate at 8 lb. per acre. At 16 lb. per acre, 4 percent DDT was more effective than a 1 : 1 basic copper arsenate-sulfur mixture, or lead arsenate and cryolite at 8 lb. A high poundage of a low concentration of DDT was better than a low poundage at a higher concentration. Immediately after application DDT was about equally effective as a dust or spray, but after four applications and a 0.46-in. rain the residual action of the spray was slightly greater. In a field test with randomized small plots and three dustings at about 16 lb. per acre-application, the gains in seed cotton per acre were 320 lb. with 8 percent DDT, 273 with calcium arsenate, 238 with 4 percent DDT, 154 with 2 percent DDT, and 148 lb. with 1 percent DDT. In a large-plot experiment where four dustings were made at 5-day intervals at the rate of 16 and 15 lb. per acre-application, the gain from 4 percent DDT was 736 lb. and from calcium arsenate 688 lb.

DDT compared with other insecticides for control of hemipterous insects on cotton, W. A. STEVENSON. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 531-533).—Because of the need for a better insecticide against this complex group of pests and the high effectiveness shown by DDT in cage tests, several comparative experiments were carried out in the field, with promising results. In hand-dusting tests of five insecticides—some used at different strengths—each treatment was followed by significant control of injurious insects over the checks; DDT plus sulfur, however, resulted in significantly better control and a higher cotton yield than any of the sulfur arsenicals used. Airplane dusting at weekly intervals—July 11-August 28—gave a seasonal reduction of over 57 percent of the injurious species. In a late-season airplane dusting test in the presence of low insect populations the treatment did not pay. In a power-machine dusting experiment—seven applications, June 28-August 9—the insecticides proved less effective in reducing insect populations, but the DDT mixtures were slightly more so than the others.

Timing rotenone applications for control of the pea aphid on Long Island, with special reference to mosaic incidence, H. C. HUCKETT (*New York State Sta. Bul.* 713 (1945), pp. 30, illus. 8).—This publication presents data relating to the pea aphid on Long Island as influenced by weather, crop development, and to the incidence of virus diseases on peas as denoted by the symptoms. Records from experimental plots were obtained during the years 1939–1944, inclusive. Results show that the peas were infested with aphids earlier in the season at Hicksville than at Riverhead, N. Y., and that the infestation increased at a higher ratio throughout the season. Mosaic was also earlier in its appearance and progress at Hicksville. During the blooming and fruiting period a marked increase in aphid infestation and mosaic symptoms invariably occurred, and increase in disease was apparently due to secondary infection caused by transmission of the virus by aphids. Comparative tests to determine the value of rotenone for aphid control, as reflected in yield of pods and by their influence on the incidence of mosaic in the field from results at Hicksville, showed that a single application made when the plants were commencing to blossom increased average yields 26.9 percent over nontreated plots and reduced the proportion of apparently diseased plants to 9.3 percent compared to 17.77 percent in nontreated plots during the seasons 1941, 1943, and 1944. Two to five applications, including the one made when the plants were commencing to bloom, increased the average yield 25.8 to 32.4 percent over nontreated plots and reduced the number of apparently diseased plants to proportions ranging from 6.9 to 11 percent. Small increases in yield from many plots that received more than a single application thus, timed were regarded as being due largely to the inhibitive influence of nonfavorable conditions on the productivity of plants during the blooming period, as, for example, high temperatures and strong winds. Results from Riverhead, where pea aphid infestation was lighter than at Hicksville, were not conclusive, but the trend of results tend to support the findings at Hicksville relative to the number and timing of applications deemed most useful.

Étude sur les produits utilisés en France contre le Doryphore [Study of the products employed in France to control the Colorado potato beetle], M. RAUCOURT and H. BÉGUÉ (*Paris: Impr. Natl.*, 1942, pp. 115, illus. 42).—Following an introductory chapter on the development of commercial insecticides against the Colorado potato beetle since 1932, this contribution deals with investigations of lead arsenate sprays, commercial arsenicals, rotenone and fluorine insecticides, the use of calcium cyanide as an insecticide, experiments with nicotine products, insect repellents, and ovicidal products, and a general note on the field tests. Practical recommendations are given. There are 28 references.

Some data on the biology of the sugarcane borer *Eldana saccharina* Wlk., J. DICK (*So. African Sugar Technol. Assoc., Ann. Cong. Proc.*, 19 (1945), pp. 75–79, illus. 4).—A brief account is given of the history of an outbreak of this borer in South Africa. Observations in laboratory and field are also presented on the biology of the various stages of the insect, including its activities and its mating and reproduction in the adult stage. This information may to some extent explain why outbreaks have not occurred in other parts of the South African sugar belt.

The control of the carrot fly (*Psila rosae* Fab.) (Diptera) with DDT, D. W. WRIGHT and D. G. ASHBY (*Bul. Ent. Res.*, 36 (1945), No. 3, pp. 253–268, illus. 4).—The proprietary emulsion Guesapon—containing 5 percent DDT—gave unsatisfactory control of the carrot rust fly injury on a plot scale; treatment of the foliage proved more effective than that of the soil. A 1 percent emulsion of DDT applied to carrot foliage in the field gave a 100 percent kill of flies exposed to it in the laboratory for 26 days after treatment and exhibited marked toxicity after a further 38 days. The DDT spray deposits on carrot foliage were very resistant to water and remained active after death of the leaves; they were also very toxic and lasting on potato

foliage Deposits given by 0.5 and 1 percent DDT emulsion were similar in toxicity and persistence, but the 0.5 percent was slower in action. From a treated surface the carrot rust fly acquired a lethal dose in a very short time, probably through absorption via the feet. Emulsions containing 0.5 and 1 percent applied to the foliage under cages in the field gave a 95 percent kill of the flies for a month after application; a high kill of other insects was also noted. Soil samples indicated that the larval population and damage were much lower in the treated cages. In a field trial, over 2 acres of carrots were treated with 0.5 DDT emulsion at about 50 gal. per acre; sweeping afterward indicated a rapid decline in abundance of flies, in striking contrast to a neighboring untreated area. These effects lasted for 21 days after treatment, with marked reduction in larval population and damage.

Record of the oriental fruit moth in Iowa and comments on an apparently new insect pest in Iowa apple orchards, C. H. RICHARDSON. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 78 (1943), pp. 135-137).—The new pest has been tentatively identified on the basis of larval material as the cherry fruitworm. Thus far attacks have been observed only on the young growth of apple trees.

The identity of a mealybug vector of "swollen shoot" virus disease of cacao in West Africa, W. J. HALL (*Bul. Ent. Res.*, 36 (1945), No. 3, pp. 305-313, illus. 1).—It is recognized that although no taxonomic grounds have been detected to warrant the subdivision of *Pseudococcus njalensis*—believed synonymous with *P. exitabilis* Laing—into two or more distinct species, further knowledge may result in the establishment of biological forms. "It is felt, however, that in view of the great economic importance of the species in question, it is desirable to place on record this discussion of the taxonomic aspects of the problem."

Control of the shot-hole borers in citrus trees, W. L. THOMPSON. (Fla. Expt. Sta.). (*Citrus Indus.*, 26 (1945), No. 12, pp. 3, 21).—According to tests briefly reported, DDT appears to be effective in killing adult borers if the trunks of the trees are kept covered with it.

DDT and rotenone used in oil to control the California red scale, W. EBELING. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 556-563).—The method devised for evaluating the effectiveness of insecticides consisted of counting the number of adult scales on 40 twigs, leaves, or fruits per tree in subplots of 10 or 12 trees each. Each material was applied to 2 or 3 subplots, and 3 to 14 mo. later the trees having had pretreatment counts were again examined so that corrections in the final ratio of population density could be made on the basis of pretreatment variation among the plots. When derris extractives or cube root were added to the oil, the amount of oil deposited by the sprays was determined, while in the tests with oil and DDT only the amount of DDT recovered from the surface was determined. In comparative tests, the needlelike crystalline form in which DDT is deposited by a kerosene spray apparently had greater residual value than the form deposited from aqueous suspensions. The 5 percent kerosene-DDT spray was as good as, or better than, the usual 1.67 or 1.75 percent regular light-medium or heavy-medium spray-oil treatment; 3 percent kerosene-DDT spray was usually not as effective as the regular oil spray. Gesarol AK-20 at the rate of 10 lb. per 100 proved much inferior to regular oil spray, but exhibited a certain degree of effectiveness in reducing the red scale population as compared with untreated controls. Derris extractives or cube root added to regular oil sprays sometimes increased the effectiveness of the treatment over oil alone, but in one case decreased it and in another proved of no advantage. Added to kerosene-DDT sprays, cube root in nearly all cases reduced the effectiveness over kerosene-DDT alone. In areas where citrus red mites and citrus aphids are ordinarily a problem, the DDT resulted in an increase of their number; this was especially noticeable when no oil of the light-medium or heavier grades was used, as in the kerosene-DDT, AK-20, or 4 percent DDT

dust treatments. No signs of injury to orange or lemon trees attributable to DDT were noted, whether the DDT was dissolved in oil or employed in any other way. Further details are included.

Laboratory studies with rotenone oil in sprays to control the California red scale. D. L. LINDGREN, J. P. LADUE, and R. C. DICKSON. (Calif. Citrus Expt. Sta.), (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 567-572).—A laboratory method was devised for rapid and accurate determinations of small differences in the effectiveness of oil sprays against this scale. Three grades of oil were used in tests with and without various concentrations of derris extractives or ground cube root and with various mutual solvents. When derris extractives were incorporated into light-medium spray oil with *n*-butyl phthalate as solvent, there was a progressive increase in the toxicity of the oil to the scale as the concentration of the extractives was increased from 0 to 0.7 percent. Whether straight oil was used as a tank mixture with blood-albumin spreader or an emulsive oil containing 1 percent glyceryl dioleate as emulsifier made no difference in the insecticidal effectiveness of the spray, though the latter deposited less oil on the grapefruits. Ground cube root (200-mesh) soaked in straight oil or emulsive oil was about as effective as the derris extractives incorporated into the oil by mutual solvents. Mutual solvents reducing the oil-depositing efficiency also reduced the insecticidal action. When the derris extractives were dissolved in a portion of the required amount of mutual solvent at 110° C., and the remainder was added to cool the solution quickly, the toxicant had no greater insecticidal power than when the extractives were dissolved in the entire amount of solvent at 60° and cooled gradually. The result of a 6-mo. aging on the insecticidal action of derris extractives in *n*-butyl phthalate, di-isobutyl ketone, and diamyl phenol was determined. Aging reduced the effectiveness most when the extractives were dissolved in *n*-butyl phthalate, and only slightly when dissolved in di-isobutyl ketone; with diamyl phenol, practically no deterioration occurred. When the toxic ingredients of cube root were extracted by soaking in light-medium emulsive spray oil, no reduction in the effectiveness of the oil was caused by a 6-mo. aging; a 12-hr. soaking of the ground cube root in the oil apparently resulted in complete extraction of the toxic ingredients. When the cube root was added directly to the oil spray in the tank, the insecticidal action of the spray was less than when the cube root was stirred into the oil before pouring into the tank.

A new host for *Composia fidelissima vagrans* Bates. J. R. WATSON (*Fla. Ent.*, 28 (1945), No. 2, p. 29).—A note reporting this moth as feeding on *Stephanotis* in Florida.

Biology and control of ash plant bugs in California. R. L. USINGER. (Univ. Calif.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 585-591, illus. 4).—This bug (*Neoborus illitus* Van Duz.) is said to be at present the worst pest of ornamental ash trees in California. It is univoltine. The eggs hatch when the first leaves appear during late February and early March in the vicinity of Davis. Nymphal development requires about 25 days, involving five instars. Mating occurs about mid-April, the ♂♂ dying soon thereafter. The ♀♀ oviposit in the current-growth stems during April-May; the eggs remain relatively undeveloped in the plant tissue during summer and fall but develop more rapidly and swell by absorption of water during the winter months. Expansion being possible only in one direction, the egg cap bursts and a yolk plug is extruded; hatching follows and the annual cycle is repeated. *N. pacificus* Van Duz. is less abundant on ornamental trees; its life cycle is similar to *N. illitus* except for the second spring generation. Injury by these bugs starts with the feeding of newly emerged nymphs on the opening buds. White areas and black excrement spots are characteristic evidence on large leaves; the stems and entire current season's growth wilt as the season advances, and finally entire limbs become defoliated. After oviposition and death of the bugs, new leaves

are put out and the tree regains a superficially normal appearance during the summer. Control with the triethanolamine salt of 2,4-dinitro-*o*-6-cyclo-hexyl-phenol at 1 to 400 plus 2 percent Winter Soluble Oil with Valsol as a wetting agent at 1 to 1,600 was effective as an ovicide. A mineral oil with oleic acid, a spreader, and rotenone in camphor sassafras oil gave complete control of both nymphs and adults at dilutions of 1 to 400 with blood albumin as a spreader. The oil-rotenone spray should be applied during March-April because the bugs are then wingless; moreover, control at this time prevents oviposition.

Notes on the great elm leaf beetle, E. G. KELSHEIMER (*Fla. Ent.*, 28 (1945), No. 2, pp. 25-27, illus. 1).—Field and descriptive notes on *Monocesta coryli* (Say), said to have completely defoliated two trees of Florida elm, spring of 1944.

The biology, economic importance, and control of the pine bark weevil, *Aesiotus notabilis* Pasc., A. R. BRIMBLECOMBE (*Queensland Jour. Agr. Sci.*, 2 (1945), No. 1, pp. 88, illus. 36).—This weevil is said to be endemic to Australian rain forests in which its natural hosts—species of *Araucaria* and *Agathis*—are components; it is now common in extensive plantations of *Araucaria cunninghamii*. Attacks occur on plantation trees through deep bark wounds made by pruning operations; larvae emerging from eggs laid on or near the branch stubs tunnel in the cambial region, invariably causing malformation and in some cases killing the trees. This comprehensive investigation gives a review of the literature (15 references) and presents data on the ecological and meteorological relations of the pest, symptoms of attacks and the importance of the injuries, the systematics, the development and habits of the insect—including the influences of temperature and humidity, a discussion of the life cycle and seasonal history, and methods of control. The importance of associated insects also receives brief mention.

DDT and other insecticides to control the Saratoga spittle insect on jack pine, R. F. ANDERSON. (U. S. D. A., Univ. Wis., et al.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 564-566).—In preliminary tests of various insecticides against *Aphrophora saratogensis* (Fitch), DDT at the rate of 83 lb. to 100 gal. was the most promising because it continued effective for several weeks after application. A mixture of sabadilla and hydrated lime (20-80) used as a dust proved very toxic when freshly applied but failed to retain its toxicity when exposed on the trees. Ordinary hydrated lime and bordeaux were surprisingly effective.

The effect of mercury vapour on the eggs of *Calandra granaria* (L.) (Col.: Curculionidae), O. W. RICHARDS (*Bul. Ent. Res.*, 36 (1945), No. 3, pp. 283-290, illus. 1).—To determine the percentage hatch of granary weevil eggs, it is recommended that the grain containing them be kept for 6 to 10 days at 25° C. after a 2-day oviposition period. Pretreatment of grain with mercury vapor made no difference in the fertility of eggs deposited afterward. At 25°, 99 percent of the eggs were sterilized in 24 hr. and 87 percent in 8 hr., using what probably approached the saturated vapor. At 10°, the sterilization for periods of 24, 48, and 72 hr. was 44, 87, and 93 percent. At 25°, mercury vapor penetrated at least 30 cm. of grain in 2 days; at 12°, it penetrated at least 90 cm. in 7 days.

Food preferences of the firebrat, B. G. BERGER. (Ill. Nat. Hist. Survey). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 577-582, illus. 1).—The author developed a method—used in this study—for assaying the attractiveness of foods to the firebrat, an insect which is able to select among foods equally available. A total of 138 different foods or combinations were thus assayed, 53 of them being also re-evaluated. Among a number found attractive, the combination of 85 percent wheat flour and 15 percent powdered sugar appeared the most practical for use in baits on account of its ready availability and ease of mixing. Sugar added to some baits improved their attractiveness to the firebrat; salt failed to improve flour as a bait. A combination of certain baits proved more attractive than any of the individual components alone.

Insect damage to nylon, R. L. PATTON. (Cornell Univ.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 522-523).—Nylon which is finished completely or through the scouring process is very susceptible to damage by larvae of several species of carpet beetles—especially the varied carpet beetle. The important factor in the attractiveness was found not to be connected with olfactory stimulation. Furthermore, the larvae do not digest the nylon eaten, though it is conceivable that they could acquire a small amount of nutritive value from it. From the observations made it appears that the tactile senses of the insect are highly important in their selection of food; the finish imparted to the fiber is therefore believed to be the critical factor.

An isolated external parasite causing serious damage and loss in fur pelts, N. L. GARLICK (*Amer. Fur Breeder*, 18 (1945), No. 5, pp. 8, 10).—Very considerable losses to fur farmers in the northwestern United States are reported by the author as due to a mite which he calls the "tail mite" and for which "no scientific name is available." It does not invade the skin or cause lesions but lives near the roots of the hair, setting up an intense itching as it moves along and thus causing the affected animal to bite, scratch, and pull out its hair; some pelts are ruined, while others require considerable repair. Notes on the life cycle are presented. Control measures include sanitation and insecticidal dips.

The nose bot fly of deer, C. M. HERMAN (*Calif. Fish and Game*, 32 (1946), No. 1, pp. 17-18, illus. 2).—A note on the maggot stage of a fly invading the nasal passage and throat of deer.

A preliminary study of cattle grubs in northern Utah, C. J. SORENSON (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 4, pp. 11-12, illus. 4).—The survey reported indicates cattle grubs to be State-wide in distribution. On the back of a single heifer 72 grub cysts were counted. The first emergence was on April 11, the larva proving to be the northern cattle grub. The grubs continued to emerge at intervals of a few days until May 29. Observations were facilitated by a canvas belt or jacket designed to cover the heifer's body between the front and hind legs; in this the grubs were held without injury. A brief summary of 1945 statistics on cattle treatment for control in the State is included.

Dragonflies predaceous on the stablefly (*Stomoxys calcitrans* (L.)), M. WRIGHT (*Fla. Ent.*, 28 (1945), No. 2, pp. 31-32).—The fact that dragonflies actually feed on stableflies is further verified (E. S. R., 94, p. 364).

DDT surface sprays for control of stablefly breeding in shore deposits of marine grass, E. B. BLAKESLEE. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 548-552).—Tests of light surface sprays of bay-water emulsions of both technical DDT and the DDT residual oil indicated that either may be effectively employed to control the stablefly breeding in marine-grass deposits; small-plot tests have shown, however, that DDT is about five times as toxic as DDT residual oil. When applied to already infested grass at 0.5 percent for DDT and 2.5 percent for the residual oil—at the rate of 2 gal. per 100 sq. ft.—a 90- to 95-percent kill of emerging adults was obtained. When DDT was applied at the same concentration and dosage to uninfested green grass not subjected to tidal washing, the grass was permanently protected from critical fly breeding. Infested grass treated and subjected to tidal wash exhibited an individual kill of 90 percent from the combined effect of spraying and tidal submergence. Beach tests—where materials were applied in a way simulating control procedure—gave an indicated control of 84 percent on heavily tide-washed material and 99- to 100-percent control on grass deposits not subjected to tidal inundation. The maximum amount of dilute spray applied per mile was 600 gal.; the minimum, about 100 gal.

Further observations on the stability of lime-sulphur during dipping or spraying sheep, J. L. HILL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1945), No. 3, pp. 201-208).—The detailed analyses given in further studies (E. S. R., 89,

p. 590) reveal the change in chemical composition of lime-sulfur fluid (initially about 1 percent weight/volume polysulfide S) during the progress of dipping trials. When used in the swim dips the polysulfide concentration and ratio never fell below effective strengths during the trials, and the decrease was negligible when the dip was stored overnight. Lime-sulfur may be used as a dipping agent in power-spray units provided the volume of fluid in circulation never falls below 200 gal. Amounts of wetting agents found suitable for use with these dips and sprays are given. When sheep dipped immediately after shearing were examined 13 days later, shear cuts were found inflamed and suppurating and some of them were fly-blown. Preferably, dipping should be done 7 to 10 days after shearing, when the wounds have commenced to heal.

Scheloribates chauhani, a new species of oribatid mite from India (Acarina: Ceratozetidae), E. W. BAKER. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 35 (1945), No. 12, pp. 386-388, illus. 6).—The oribatid mites have aroused interest in recent years, since one species has been proved an intermediate host to the sheep tapeworm. The new mite was collected from grass

New insecticides for chicken lice control, H. S. TELFORD (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 573-576).—With a salt-shaker type applicator the author tested 37 louse powders on 149 chickens which were infested with the chicken body louse, fluff louse, and shaft louse *Menopon gallinae* L. Materials acting relatively quickly and possessing residual properties were 0.5 to 4 percent DDT, 10 percent derris (5 percent rotenone), 2 and 10 percent tetramethyl thiuram salts, and powders containing 30 percent sulfur mixed with one of the following: Lethane B-71, Thanite, phenothioxine, NH Dust, or diphenyl, each at 5 percent, or pyrethrins at 0.066 percent. Sodium fluoride at 33 percent, Kryocide (cryolite) at 30 percent, and micronized wettable sulfur were highly effective but slow to act. The duration of insecticidal potencies of some of the more promising materials was determined by placing previously deloused chickens in an infested flock and examining them later. Six birds dusted with 4 percent DDT had louse infestations approximating the original within 30 to 34 days; a longer residual effect was observed on 4 birds dusted with micronized wettable sulfur, but this was less on 6 birds dusted with sodium fluoride, 33 percent. Relatively quick-acting mixtures without residual effect when employed as sole toxicants were Lethane B-71, phenothioxine, NH Dust, and *o*-nitrophenyl, each at 10 percent, and Thanite at 5 percent. Unsatisfactory results were obtained with 15 percent sodium fluoride; 0.5 percent nicotine (Black Leaf 155); 0.25 and 0.125 percent DDT; 30 percent Genicide (xanthone); 5 percent 2,4-dinitro-*o*-cyclohexyl phenol; sabadilla and orthophenylphenate, each at 10 percent; 2 percent 2,4-dinitroanisole; a mixture of 2,4-dinitroanisole and IN-930 (N-isobutylundecylenamide), each at 2 percent; a mixture of diphenyl at 2 percent and Velsicol AR-50 at 5 percent; and two dilutions to 0.033 and 0.016 percent of pyrethrins in a proprietary louse powder. There are 22 references.

A new locality record for five species of helminth parasites of the bobwhite quail, J. W. WARD. (Miss. Expt. Sta.). (*Helminthol. Soc. Wash. Proc.*, 12 (1945), No. 2, pp. 71-72).—A preliminary account of the author's records for Mississippi.

Attempted transmission by each of two species of fleas, *Xenopsylla cheopis* (Roths.) and *Diamanus montanus* (Baker), F. M. PRINCE and M. C. MCMAHON (*Pub. Health Rpts. [U. S.]*, 61 (1946), No. 3, pp. 79-85).—When given an opportunity to feed on tularemia-infected white mice, 68 to 90 percent of the oriental rat fleas and 80 to 95 percent of *D. montanus* became infected. The disease was produced by inoculating infected fleas or their feces for varying periods—up to 32 days in the oriental rat flea. Fleas killed immediately after infection and stored at room temperature as long as 5 days in a dry condition or for 7 days in saline produced tularemia when triturated and injected into healthy mice. Results were negative when 59

infected fleas (both species) bit 46 normal white mice 312 times; 25 fleas of each species exposed to tularemia-infected mice and then placed in clean cages with healthy guinea pigs failed to produce the disease in these animals over a 32-day period.

Control by D. D. T. of flies breeding in percolating sewage filters, T. G. TOMLINSON (*Nature [London]*, 156 (1945), No. 3964, pp. 478-479, illus. 1).—Tests of the treatment of small experimental filters with DDT as a powder applied at the rate of 300 lb. per acre or as an emulsion in naphtha or kerosene at a rate of 50 to 100 lb. DDT per acre gave over a 90 percent kill of *Anisopus* and *Psychoda* larvae without affecting such scouring organisms as enchytraeid worms and Collembola. In preliminary trials at these concentrations DDT was also proved nontoxic to bacteria and fungi, and thus had no deleterious effect on their purifying powers.

Collection and preservation of sandflies (Phlebotomus) with keys to U. S. species (Diptera: Psychodidae), C. J. ADDIS (*Amer. Micros. Soc. Trans.*, 64 (1945), No. 4, pp. 328-332, illus. 16).—Because it seems likely that sandflies have a much more extensive range in the United States than is indicated by the six known species observed here, that there are other species which have not been reported, and because of their role as vectors of disease in man, their potential importance in this country is evident. For these reasons the author presents notes on the collection and preservation of specimens, along with keys for identifying dry and cleared specimens of the ♂♂ and ♀♀ of the six known species thus far reported.

The residual toxicity of DDT to bed-bugs (Cimex lectularius L.), S. BARNES (*Bul. Ent. Res.*, 36 (1945), No. 3, pp. 273-282).—This investigation shows that DDT is more toxic to bedbugs when available on a surface as an oil solution than as a dry film, and that the toxicity of the latter is determined to some extent by the volatility of the medium in which it is applied. It appeared that the minimum exposure to a dry film of DDT necessary for acquiring a lethal dose is an hour, and that this critical period is constant irrespective of the nature of the DDT-treated material. Tests with DDT-impregnated filter paper indicated that this period can be curtailed considerably by adding a fine oil spray. The persistent toxicity of DDT varied according to the nature of the surface to which it was applied. Persistent though DDT is, the results of this study failed to confirm the far-reaching claims made for it by some other workers. It is said to be the minute crystals of DDT deposited on a treated surface that are responsible for its toxicity—both immediate and persistent; large crystals which the insect may pick up did not appear to have a marked lethal effect. Applied to smooth surfaces, even the small crystals did not completely withstand simple household operations such as repeated rubbing and washing with cold water. Of a number of insecticides tested as direct sprays, pyrethrum proved 10 times more toxic to bedbugs than DDT or its analog di-(4-methoxyphenyl) trichlorethane. As residual sprays, however, the last two substances were far more efficient than pyrethrum.

Aberrations and variations in anopheline larvae of the southeastern United States (Diptera: Culicidae), L. M. ROSE (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 9, pp. 257-278, illus. 66).—Beginning in June 1944, a careful examination was made of a large number of the common southeastern anopheline mosquitoes and variations were noted. It is the purpose of this paper to describe and illustrate the variety of forms which certain taxonomic characters may assume.

An evaluation of various measures of Anopheles larva density, P. F. RUSSELL, T. R. RAO, and P. PUTNAM (*Amer. Jour. Hyg.*, 42 (1945), No. 3, pp. 274-298, illus. 9).—Various expressions of anopheline larval density were computed by simple and by partial correlation technics. The data were collected in a 33-mo. survey (1937-40) in the Madras Presidency, India, in a recently opened rice field area where *A. ulicifacies* was a prolific breeder as well as the malaria vector. The analysis

included all anopheline larvae captured in the area. A good correlation was found between the logarithms of the monthly captures and either collection unit, minutes, or square feet; the relationship is therefore exponential in character. When regression equations are computed expressing the relationship between larvae captured and both minutes and square feet, the minutes spent in dipping are shown in general to be the determining factor. The area covered does not contribute to the number of larvae captured when time is held constant. The precise form of the equation describing the relationship differed for larvae captured from different habitats; it also changed from year to year. For routine field use a simple ratio of larvae captured to minutes spent in dipping was found to furnish a practicable measure of density.

A new species of *Culex* from New Guinea (Diptera: Culicidae), K. L. KNIGHT and L. E. ROZEBOOM (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 9, pp. 289-295, illus. 13).—The new mosquito described is *C. (Neoculex) binigrolneatus*.

Note on *Haemagogus capricornii* Lutz, 1904 (Diptera: Culicidae), N. L. CERQUEIRA and J. LANE (*Ent. Soc. Wash. Proc.*, 47 (1945), No. 9, pp. 279-288, illus. 10).—Because of the role of these mosquitoes as forest transmitters of the yellow fever virus, it is desirable that the exact taxonomy of different members of the genus *Haemagogus* be described accurately. It has been the authors' purpose in this paper to establish definitely the taxonomic characteristics of both ♂♂ and ♀♀, as well as the developmental stages of *H. capricornii*.

Importancia de algunos de nuestros mosquitos en la transmisión de la filaria del perro en la Argentina (The importance of some mosquitoes of the Argentine Republic in the transmission of dog filariasis), J. BACIGALUPO (*Puerto Rico Jour. Pub. Health and Trop Med*, 21 (1945), No. 1, pp. 3-13, illus. 11; *Eng.*, pp. 14-16).—The author reports experimental demonstration of the development of the filaria in *Aedes albifasciatus* Macq., and thus believes that it may be a vector of canine filariasis. The data suggested that *Psorophora cyaneescens* Coq. could also act as an intermediary host. The southern house mosquito would not feed on infested dogs, and thus no conclusions could be drawn as to its possible relation to transmission. None of these mosquitoes was found infested in nature. Accompanying photomicrographs illustrate the location of the infesting larvae within the labium of the mosquito proboscis.

Entomology in malaria control, H. F. SCHOOF (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 517-522).—The author briefly outlines the progress and importance of entomology in malaria control during the past 8 yr. and discusses its functions in this field, giving examples of how this was done in the North Carolina program.

A rapid field method for assessing the spreading power of anti-malarial oils, N. K. ADAM (*Bul. Ent. Res.*, 36 (1945), No. 3, pp. 269-272).—The method involves comparing the spreading power of an unknown with a standard whose spreading power has been previously determined; drops of the standards and of the unknown are placed in turn on a particular water surface and observations are made on which spreads against the other, pushing the weaker spreader of the two back into a droplet. The spreading standards need to be liquids which are nonvolatile and insoluble in water—or at most very slightly so. Details of the technic are outlined.

Some dinitrophenol derivatives as mosquito larvicides, H. I. MAGY and W. M. HOSKINS. (Univ. Calif.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 524-527, illus. 1).—Solutions of 3,5 dinitro-*o*-cresol, 2,4 dinitro-6-cyclohexyl phenol, or dicyclohexylamine salt of 2,4 dinitro-6-cyclohexyl phenol were found toxic to larvae of the mosquito *Culiseta incidens* (Thomson) only at relatively high concentrations, but when only small amounts of suspended particles of the last two were present high mortality resulted within 24 to 48 hr. or less—hence they function as stomach

rather than contact poisons. Field trials with dusts applied in the weeds and reeds along an irrigating ditch gave a high kill of larvae of *Anopheles maculipennis* sub. sp. with dusts containing 10 percent 2,4 dinitro-6-cyclohexyl phenol or 40 percent dicyclohexylamine salt—each applied at rate of 50 lb. per acre.

TDE, 1,1-dichloro-2,2-bis(p-chlorophenyl)ethane, as an anopheline larvicide, C. C. DEONIER and H. A. JONES. (U. S. D. A.). (*Science*, 103 (1946), No. 2662, pp. 13-14).—The preliminary laboratory tests outlined showed sufficient toxicity to warrant further study of this compound. Although early advice suggested that the material might be difficult to manufacture, from more recent information it appears that TDE may be produced on a large scale.

DDT as a culicine larvicide, P. M. EIDE, C. C. DEONIER, and R. W. BURRELL. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 537-541).—DDT proved very effective as a toxic agent against culicine mosquito larvae. In suspensions at 1 p. p. m. or more it exhibited residual toxicity to species breeding in rain barrels. Suspensions and emulsions were more generally effective against the fresh-water and salt-marsh culicines than were the surface applications in dusts or oil solutions. As little as 0.05 p. p. m. was effective against *Psorophora confinnis* (L.-Arr.), *P. ciliata* (F.), the southern house mosquito, yellow-fever mosquito, salt-marsh mosquito, and *Aedes taeniorhynchus* (Wied.).

The use of DDT as a mosquito larvicide on still waters, C. R. RIBBANDS (*Bul. Ent. Res.*, 36 (1945), No. 3, pp. 315-330).—Under optimum conditions, 5 percent DDT in oil applied at the rate of 1 pt. per acre (= 1 oz. DDT) proved lethal to both anopheline and culicine larvae in 24 hr.; applied at 0.2 pt. per acre, a 75 percent kill was obtained in 24 hr. and 100 percent in 72 hr. Waste engine oil alone at 2 gal. per acre caused no diminution of the large anophelines in 24 hr., but provided complete elimination by the fifth day; when applied at 8 gal. per acre under optimum conditions without rain, development of anopheline larvae was prevented for 28 days and the effect was emphasized on addition of 5 percent DDT to the waste oil. The residual effects of DDT in oil on anopheline larvae were much greater than those on culicine larvae; the initial lethal effects were slightly greater. DDT was equally effective, whether dissolved in waste engine oil, malariol, or kerosene. DDT in oil evinced no important ovicidal or egg-laying deterrent properties. DDT and paris green applied as dusts were similar in their effects; the minimum dose effective in 1 day was at the rate of 8 oz. per acre.

The most important property of DDT in oil was its apparent lethality to larvae in a monomolecular film, enabling it to spread rapidly over a very large area with applications at intervals only. When 5 percent DDT in waste oil was applied to the edges of various types of pond the minimum lengths of edge completely cleared of anophelines were 7 ft. by 0.25 and 1 cc., 23 ft. by 2 cc., 25 ft. by 4 cc., and 40 ft. by 8 cc. The greatest distance of lethal penetration was found in ponds containing moderate amounts of surface vegetation and least on those densely packed with *Pistia* and in completely open water. Rain had no consistent effect on the penetration of doses of DDT in oil; on fairly open water it reduced the length of kill, but on water densely packed with *Pistia* it had the reverse effect. Larvae were eliminated from a large marsh by throwing 5 percent DDT in oil onto the water at 12-ft. intervals at a dosage of 2 pt. per acre. No apparatus was necessary with this method.

DDT dispersed from airplanes for control of adult mosquitoes, A. W. LINDQUIST, A. H. MADDEN, C. N. HUSMAN, and B. V. TRAVIS. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 541-544, illus. 2).—Sprays containing 5 percent DDT dispersed from a Piper Cub plane at 2 to 3 qt. per acre resulted in a good reduction of adults of *Aedes taeniorhynchus* (Wied.) in dense mangrove and brush growths. A reduction as high as 99 percent was obtained in sprayed plots; such control, however, was not secured in all tests because of strong winds and possibly

other factors. In tests giving a relatively low control after 24 hr., the reduction of adults in the area at the time of treatment was doubtless higher than the 24-hr. mortality figures would show. The promising results obtained with these aerial sprays—even on small plots—suggest that DDT sprays applied from aircraft might be employed to control disease vectors ahead of advancing troops and in other areas where feasible to use this method. Dusts containing DDT were ineffective in adult mosquito control when dispersed from a plane, but the method may prove useful under certain conditions. A combination smoke and spray produced by injecting 20 percent DDT in cyclohexanone and motor oil into a specially constructed exhaust pipe gave excellent control of mosquitoes; 5 percent DDT in motor oil proved ineffective.

DDT-oil sprays applied from an airplane to control *Anopheles* and *Mansonia* mosquitoes. A. W. LINDQUIST and W. C. McDUFFIE. (U. S. D. A.). (*Jour. Econ. Ent.*, 38 (1945), No. 5, pp. 545-548).—Two tests conducted in the Panama Canal Zone (1944) with sprays containing 10 percent DDT in oil dispersed over jungle forest from a Cub plane equipped with a portable spray unit proved highly effective against adult *Anopheles* and *Mansonia* mosquitoes. In one test a reduction of 98 to 100 percent of *A. albimanus* Wied. and 98 percent of *Mansonia* spp. was obtained during 4 days after spraying; after 2 more days some infiltration of adults had occurred and a reduction of 70 percent of *Mansonia* and 76 percent of *Anopheles* was then indicated. Records 21 days after application showed as many mosquitoes in the treated as in the untreated areas. Larvae of both *Anopheles* and *Culex* were controlled. In the second test a 90- to 98-percent control was demonstrated at 2 days after spraying, when the test was terminated. These preliminary tests fully confirmed the results of earlier experiments against *Aedes taeniorhynchus* (Wied.), and are said to represent the first demonstration of the effectiveness and practicability of airplane spraying of jungle forests against anopheline and other adult mosquitoes. "As a result of these tests the systematic spraying of large areas was recognized as a potent weapon for malaria control, especially under certain military conditions, and, consequently, research was stimulated along this line with all types of aircraft."

Observations on the abatement of pest mosquitoes with DDT residual sprays. C. B. WISECUP and W. D. SHILLINGER. (U. S. D. A.). (*Fla. Ent.*, 28 (1945), No. 2, pp. 27-29).

Silk culture in California. E. O. ESSIG (*California Sta. Cir.* 363 (1945) pp. 15, illus. 4).—An account of the early development of the silk culture industry in California. Notes are included on modern methods for rearing silkworms, food plants, pests of silkworms, diseases affecting silkworms, and new methods suggested for sericulture in California. References on this subject are listed.

Ottawa tests on wintering nuclei. C. B. GOODERHAM (*Canad. Bee Jour.*, 53 (1945), No. 9, pp. 157-159, illus. 2; also in *Gleanings Bee Cult.*, 73 (1945), No. 11, pp. 454-455, 482).—The main points to be stressed from this investigation on overwintering of bees are that of 247 double nuclei, put away for the winter, 246 came through safely and 216 still contained 2 queens—meaning 216 surplus queens for emergency requeening if needed in the spring. In trials with 3 and 4 nuclei the losses were too heavy to recommend more than 2 nuclei to the one hive, as the latter can be overwintered indoors or out with a minimum of loss.

ANIMAL PRODUCTION

The determination of the rate of thyroxine secretion by certain domestic animals. A. B. SCHULTZE and C. W. TURNER (*Missouri Sta. Res. Bul.* 392 (1945), pp. 89, illus. 17).—"Determination of the thyroid's secretion rate in equivalent

amounts of d,l-thyroxine was made in the growing fowl and growing and lactating goats. Limited investigation of the rate of thyroxine secretion of dairy cattle was made.

"The rate of secretion by the thyroid of the White Leghorn cockerel ranged from an average of 1.95 μ g. d,l-thyroxine per chick per day at 2 weeks of age (2.76 μ g. per 100 gm. body weight) to 25 μ g. d,l-thyroxine per chick per day at 27 weeks of age (1.63 μ g. per 100 gm. body weight). The relation of the thyroxine secretion rate to body weight can be expressed by the equation $Y = 0.065X^{0.81}$, where Y equals micrograms d,l-thyroxine and X the body weight in grams. The rate of secretion by the thyroid of White Plymouth Rock chickens ranged from an average of 4.5 μ g. d,l-thyroxine per chick per day at 5 weeks of age (1.98 μ g. per 100 gm. body weight) to 35 μ g. d,l-thyroxine per chick per day at 26 weeks of age (1.44 μ g. per 100 gm. body weight) in the male. In the female the rate ranged from an average of 4.75 μ g. d,l-thyroxine per chick per day at 5 weeks of age (2.01 μ g. per 100 gm. body weight) to 29 μ g. d,l-thyroxine per chick per day at 26 weeks of age (1.50 μ g. per 100 gm. body weight). The relation of thyroxine secretion rate to body weight for the male is $Y = 0.053X^{0.88}$, for the female $Y = 0.073X^{0.89}$, where Y equals micrograms d,l-thyroxine and X body weight in grams. The thyroxine secretion rate was higher, on a body weight basis, for the White Leghorn cockerels than for the White Plymouth Rock cockerels, being about 10 percent higher under the conditions of the experiments. However, since the White Plymouth Rock cockerels attain greater weight at an advanced age, the average thyroxine secretion rate per chick was higher for the White Plymouth Rock cockerels. Castration of the male fowl resulted in a decrease in the thyroxine secretion rate, this decrease being about 16 percent less than that of normal under the conditions of the experiment.

"The average rate of secretion by the thyroid of the growing goat was 180 μ g. d,l-thyroxine per goat per day at 2 mo. of age and at a body weight of 22 lb. At a body weight of 45 lb., the average thyroxine secretion rate was approximately 640 μ g. d,l-thyroxine per goat per day and at a body weight of 76 lb. the average rate was about 930 μ g. d,l-thyroxine per goat per day under the conditions of the experiments. Lactating goats producing an average of 2.6 lb. of milk per day had an apparent thyroid secretion rate of 1,425 μ g. d,l-thyroxine per animal per day. These same six goats, further advanced in lactation and producing an average of 1.8 lb. of milk per day, had an apparent average secretion rate of 1,000 μ g. d,l-thyroxine per animal per day. One cow whose milk production was depressed by thiourea treatment was brought back to 87 percent of normal production by the administration of 10 mg. d,l-thyroxine per day. Another cow similarly treated was brought back to 96 percent of normal production by administration of 10 mg. d,l-thyroxine.

"The faster growing chicks of a group appeared to have a higher thyroxine secretion rate. However, since the secretion rate increases with increased body weight, the larger chicks may have had a higher secretion rate because of their greater body weight. A study of the relationship of thyroid weight and body weight in the normal fowl showed that this relation can be expressed for the White Leghorn by the equation $Y = 0.158X^{0.88}$; for White Plymouth Rock cockerels by $Y = 0.035X^{1.08}$, for White Plymouth Rock pullets by $Y = 0.062X^{0.86}$, in all equations Y being the thyroid weight in milligrams and X the body weight in grams. A study of the relation of thyroid weight to increasing body weight in the normal goat showed that the relationship was $Y = 174.6X^{0.79}$, where Y equals the thyroid weight in milligrams and X the body weight in kilograms.

"Differences in thiouracil and thiourea with respect to their ability to induce enlargement of the thyroid and their relative toxic effect were determined. In general, thiourea induced its maximum goitrogenic effect at a lower dosage level

than did thiouracil. Per unit weight of the drug, thiourea is much more toxic than thiouracil. Thyroid enlargement induced by the feeding of 0.1 percent thiouracil in the ration for a period of 2 or 3 weeks was greater per 100 gm. body weight in the female than in the male fowl. It was greater in the lighter than in the heavier breeds. It was greater in younger chicks than in older chicks and in castrated chicks than in comparable chicks. It was likewise greater in chicks and goats in good physical and growing condition than in those animals in poor physical condition. In 15-week-old White Plymouth Rock chicks the goitrogenic effect of 0.1 percent thiouracil in the feed was enhanced by the feeding of 0.01 percent dimethyl ether of diethylstilbestrol in the ration for 5 weeks. This same level of this compound lowered the goitrogenic effect of thiouracil in 15-week-old Barred Plymouth Rock pullets. Feeding the 0.01 percent level of dimethyl ether of diethylstilbestrol for 9 weeks to the 15-week-old Barred Plymouth Rock pullets resulted in no apparent change in their thyroxine secretion rate compared to that of similar control pullets. While thyroid enlargement induced by 360 mg. of thiourea administered orally once per day was three to four times the normal thyroid size in young goats, the goitrogenic effect in older goats was extremely variable with dosages ranging from 0.75 to 1.5 gm. thiourea per day or with 1.0 to 5.0 gm. thiouracil per day. This indicates the need for a more satisfactory method of administering the drugs to obtain more consistent results. The thyroids of fetal goats past midterm of intrauterine life were greatly enlarged when the mothers were treated with thiourea or thiouracil. The thyroids of fetal goats prior to midterm were not affected by such treatment of the mother. If the thyrotrophic hormone of the mother cannot pass the placental barrier, as has been indicated to be the case by other experiments, then the stage of development of the fetus when its thyroid is affected may be the time of the beginning of function by the pituitary and thyroid of the fetus."

An extensive bibliography is included.

Nutritional deficiencies of farm animals, C. F. HUFFMAN. (Mich. State Col.). (*Flour & Feed*, 46 (1945), No. 7, pp. 16-17).—A popular discussion of mineral and vitamin deficiencies in animals.

Moisture in feed samples, G. S. FRAPS and T. L. OGIER (*Flour & Feed*, 46 (1945), No. 7, p. 20).—In 144 feeds, about 50 percent increased or decreased in moisture 0.5 percent; about 25 percent increased or decreased 0.51 to 1 percent; about 14 percent showed differences of 1.01 to 1.5 percent; and in 6 percent they ranged from 1.51 to 2 percent differences. Variations in individual feeds were noted.

The respiration rate and loss of dry matter from stored bran, D. SNOW and N. C. WRIGHT (*Jour. Agr. Sci. [England]*, 35 (1945), No. 3, pp. 126-132, illus. 1).—The respiration of bran at different moisture levels was due to respiration of the plant cells still active in the bran itself and respiration of the developing microorganisms. The rate of respiration was accelerated with increased moisture content.

The composition and digestibility of northern Irish ryegrass seed and ryegrass seed cleanings.—II, Data for "flatweed," "hairgrass," and commercial Yorkshire fog seed, with a note on inorganic constituents, W. A. RUTLEDGE and R. H. COMMON (*Jour. Agr. Sci. [England]*, 35 (1945), No. 3, pp. 123-125).—In amplification of data published earlier (E. S. R., 93, p. 476), the composition and digestibility of certain byproducts of the ryegrass cleaning industry are presented and the feeding value discussed with reference to various of these byproducts.

Inspection of commercial feedstuffs, P. H. SMITH (*Massachusetts Sta. Control Ser. Bul.* 125 (1945), pp. 32).—The fifty-first report is given of the guaranteed and found analyses of feeds officially examined and, in addition, carotene determinations on commercial poultry mashes, alfalfa products, and riboflavin supplements and related information (E. S. R., 92, p. 819).

Weight changes of cattle on a Florida range, W. G. KIRK, A. L. SHEALY, and B. KNAPP, JR. (*Florida Sta. Bul.* 418 (1945), pp. 23, illus. 12).—The average weight changes of mature native Florida cows at 3-mo. intervals from June 1933 to March 1938 showed seasonal fluctuations which were largely due to variations in the average monthly temperature and rainfall and other weather conditions. Weight changes were also recorded for the heifer progeny of these cows bred to Hereford, Devon, Brahman, and Red Polled bulls. The greatest weight increases in calves and cows were from March to June when range feed was plentiful. A steady deterioration in the quality of the forage and consequent decrease in rate of gain occurred from June to December. The close similarity of weight fluctuations for various groups of heifers indicates that changes in weight were not affected by inherent differences among the groups. Second-cross heifers out of crossbred females were not as uniform as first-cross heifers out of mature cows. The native cows averaged 645 lb. in September and 541 lb. the following March. This was a greater weight change than found in Montana by Knapp et al. (E. S. R., 87, p. 556).

The utilization of urea in the bovine rumen.—IV, The isolation of the synthesized material and the correlation between protein synthesis and microbial activities, J. A. B. SMITH and F. BAKER (*Biochem. Jour.*, 38 (1944), No. 5, pp. 496-505, illus. 1).—Continuing studies of the composition of rumen liquor incubated in vitro with and without added carbohydrates (E. S. R., 90, p. 86), it was shown that the synthesis of protein was accompanied by synthesis of a starchlike polysaccharide and by an increase in the iodophile population of the medium. The greater portion of the synthesis is attributed to the masses of microiodophile bacteria which abound in the rumen. Protozoa do not appear to contribute to the synthesis. The contents of the sediment containing the synthesized material are 0.5 percent moisture, 36.3 protein, 46.6 polysaccharide, 9.5 lipid matter, and 6.2 percent ash. These values were similar to the composition of a typical feeding stuff such as linseed cake. The synthesized material was isolated as an amorphous powder.

Nutrition of the bacon pig.—XI, The minimum level of protein intake consistent with quick growth and satisfactory carcass quality (part IV), H. E. WOODMAN and R. E. EVANS (*Jour. Agr. Sci. [England]*, 35 (1945), No. 3, pp. 133-149).—Two separate experiments were conducted in continuation of previous studies (E. S. R., 85, p. 517), using individual and group feeding practices. Both showed that the omission of the protein supplement at 90 lb. live weight caused the pigs to be slightly less thrifty than controls over the period from 90 to 150 lb. live weight, and perhaps the ration of barley meal, wheat byproducts, minerals, and alfalfa meal was supplying somewhat less protein than was needed for maximum growth at this stage. Perhaps the extra protein could have been gradually reduced after 90 lb. and finally omitted after 120 lb. live weight. The slight change in the diet may have been deleterious. The small differences in the dietary effects were of minor practical importance. It is concluded that if the reduced protein supply is sufficient to support the maximum rate of growth, no significant falling off in carcass conformation or leanness need be feared.

Protein and minerals in swine feeding, T. S. HAMILTON. (Univ. Ill.). (*Flour & Feed*, 46 (1945), No. 7, pp. 18-19).—A popular account.

Relation of thiamine in the ration to vitamin deposition, intestinal flora, and physiology of the pig, M. E. ENSMINGER, W. W. HEINEMANN, T. J. CUNHA, and E. C. McCULLOCH (*Washington Sta. Bul.* 468 (1945), pp. 36, illus. 9).—In series of experiments in 1942, 1943, and 1944, eight lots of pigs were fed purified rations supplemented with five levels of crystalline thiamine (0.10, 0.19, 0.42, 0.51, and 1.02 mg. daily per kilogram of body weight) and no thiamine; five lots were fed natural grain rations containing different levels of thiamine; and one lot was fed a natural grain ration enriched with pure crystalline thiamine. The poorest gains in weight

were made and more feed was required per unit of gain on the thiamine-deficient ration. Thiamine and riboflavin were much more efficiently utilized from natural grain rations than from purified grains, and there was greater destruction of vitamins in the intestinal tract when fed in the crystalline form than when fed in natural feeds. The deposition of thiamine in the meat was related to the amount in the ration. The loin and ham were usually highest in thiamine, followed in order by shoulder, heart, liver, and kidney. Sausage was intermediate between the amount in the heart and liver. Pork liver was higher than other cuts in riboflavin, with ham, shoulder, and loin ranking low. Sausage was intermediate between the riboflavin of the shoulder and loin. The common symptoms of thiamine deficiency in the pig were vomiting, enlarged heart, anorexia, slight staggering cyanosis, and a slight reduction in rectal temperature, heart beat, and respiration. Coliform counts of feces were approximately 1,000 times higher on purified rations than for pigs on natural grain rations, suggesting a possible difference in intestinal vitamin synthesis. The amount or source of thiamine did not affect the niacin in the ham or the calcium, phosphorus, hemoglobin, or sugar of the blood. Thiamine can be stored and utilized over long periods of time. At least 56 days were required for pigs to lose their appetites.

Some observations on the need for copper in the diet of fattening pigs, R. BRAUDE (*Jour. Agr. Sci. [England]*, 35 (1945), No. 3, pp. 163-167).—The results are reported of two trials involving a total of 24 pigs divided into 3 groups so that 4 pigs in each group received 0, 25, or 50 mg. of copper per head daily. In the second trial one group receiving copper also had supplements of 50 mg. of manganese and 200 mg. of iron. The results gave no clue from analyses of the copper content or the hemoglobin as to why pigs crave metallic copper. The results were variable and did not indicate more favorable effects of copper additions than of no copper on these qualities.

Avitaminosis A in breeding sows, S. NORDFELDT (*Lantbr. Högsk. Ann. [Uppsala]*, 12 (1944-45), pp. 204-221, illus. 5).—Two groups of four gilts each were used for comparing the effects of avitaminosis A in a 6- to 8-mo. feeding test. A basal ration of ground oats and skim milk was fed to control groups receiving 50 gm. of alfalfa meal containing about 5.65 mg. of β -carotene per head daily. In the sows on the vitamin A-deficient ration, appetite decreased and growth was reduced as compared with normals. Reproduction was lowered and the number of dead pigs increased from 1.5 in the control group to 3 pigs per litter on the vitamin A-deficient ration. There was diminished vitality and heavy mortality at birth in the pigs. Nervous symptoms, digestive disturbances, and eye difficulties were noted. It was estimated that 34y of β -carotene per kilogram of body weight satisfied the need for good health of the sows and normal development of the fetuses and pigs.

Feeding horses, J. O. WILLIAMS and N. R. ELLIS (*U. S. Dept. Agr. Farmers' Bul. 1030, rev. (1945), pp. 18+*).—In this revision (*E. S. R.*, 40, p. 875), suitable rations are suggested for light, idle, and work horses, with descriptions of different feeds.

Light horses, C. F. ROOKS (*Chicago and New York: Ziff-Davis Pub. Co., 1946, pp. 159+*, illus. about 100).—A popular book on light horse production, with description of breeds and of care, management, and feeding.

[**Contributions to poultry science**] (*World's Poultry Sci. Jour.*, 1 (1945), No. 4, pp. 114-117, 118-120, 121-123, 124-125, 126-136, illus. 4).—Continuing previous studies (*E. S. R.*, 94, p. 249), articles are presented on the poultry industry in various countries, as follows: Present Conditions in the Netherlands Poultry Industry, by C. S. T. van Gink (pp. 114-117); Recommended Nutrient Allowances for Poultry (pp. 118-120); The Poultry Industry of the Philippines, by A. C. Elefano (pp. 121-123); Gifts of the Americas—The Turkey, by S. Podolsky (pp. 124-125) (*U. S.*

D. A.); Poultry Industry in China, by T. Y. Hsu (pp. 126-129); Swiss Poultry Keeping and Poultry Breeding in the War Years, by K. Kleb (pp. 130-131); and Increasing Poultry Meat Consumption—The How and Why of Consumer Education, by K. B. Niles (pp. 132-136).

Poultry nutrition up-to-date, R. V. BOUCHER. (Pa. State Col.). (*Flour & Feed*, 46 (1945), No. 7, p. 15).

Dried potato products for egg production: Statistical analysis of a laying experiment, W. BOLTON and R. W. HALE (*Jour. Agr. Sci. [England]*, 35 (1945), No. 3, pp. 158-162, illus. 1).—In 12 pens of 25 White Wyandotte pullets each, rations with corn meal and ground oats, were compared with rations containing potato flakes or slices over a 12-mo. period. Both types of potato products proved equal to the cereals in maintaining egg production, egg weight, and live weight during the year.

The relationship between egg production and body type and weight in Single Comb White Leghorn Hens, R. L. BRYANT and A. B. STEPHENSON (*Virginia Sta. Tech. Bul.* 96 (1945), pp. 8, illus. 2).—Measurements of 204 Single-Comb White Leghorn pullets were made on shank length, keel length, distance from keel to tail, body depth, and heart girth at 4-week intervals beginning at 20 weeks of age and extending through the thirty-second week and at 8-week intervals through the sixty-fourth week. Neither body weight nor body type was shown to be a reliable index of egg-production ability of the hen, nor could either be used as a guide in predicting future egg production or in estimating the past production of a hen. Body measurements at different ages are given for birds with production levels from 0 to 140, 141 to 180, and over 181 eggs each.

The porosity of egg shells, and the influence of different levels of dietary calcium upon porosity, C. TYLER (*Jour. Agr. Sci. [England]*, 35 (1945), No. 3, pp. 168-176, illus. 1).—The porosity of eggshells was considered and the effect of different levels of Ca discussed. The porosity may be measured under standard conditions and the values so obtained referred to as the porosity coefficients. The low Ca ration soon led to cessation of egg production, and the porosity of the shells was increased as the end of laying approached, but on the average the shells had higher porosity coefficient than the shells of eggs produced on normal Ca rations. A high Ca ration had no ill effects on the porosity of the shells of two birds, but many abnormal eggs were laid by two other birds and their porosity coefficients were lower than in the normal Ca group. Egg production was as good as on a normal Ca ration, and porosity coefficients were significantly higher when more Ca was included in the ration. Eggs other than the first in a clutch did not differ in porosity, but the first egg has a significantly lower coefficient than the remainder of the clutch.

The sulfur balance of the non-laying, molting, and laying hen, R. T. HOLMAN, M. W. TAYLOR, and W. C. RUSSELL. (N. J. Expt. Stas.). (*Jour. Nutr.*, 29 (1945), No. 4, pp. 277-281, illus. 1).—The sulfur balance was ascertained through low and high egg production and molt in four hens. As egg production increased, the sulfur balance decreased, usually becoming negative with 50 percent or more egg production. The sulfur balance decreased when molt and feather loss was heavy. Sulfur loss in the droppings calculated as percentage of that in the feed remained high even during severe feather loss (molt) or high egg production.

Nutrition and hatchability, R. M. BETHKE. (Ohio Expt. Sta.). (*Flour & Feed*, 46 (1945), No. 7, p. 14).—A popular discussion of the influence of vitamins and minerals on poultry growth and hatchability.

Soybean oil meal as a protein supplement for baby chicks, L. R. RICHARDSON, A. G. HOGAN, and H. L. KEMPSTER (*Missouri Sta. Res. Bul.* 395 (1945), pp. 10).—Lots of 5 to 15 Single-Comb White Leghorn or Barred Plymouth Rock chicks were used for comparing the effects of 15, 20, 25, 30, and 40 percent soybean meal on

growth during a 6-week feeding period. The rate of growth was almost as rapid when the soybean meal was supplied at a 25 percent level as when it was supplied at a level of 30 or 40 percent, but at 15 or 20 percent levels the growth rate was markedly reduced. The soybean meal rations were shown to be considerably improved by additions of riboflavin, and curled-toe paralysis was prevented, but no consistent further improvement in growth rate was produced by supplementing the ration with all the water-soluble vitamins or with supplements of dried whey, dried skim milk, dried yeast, meat scrap, or dehydrated alfalfa meal, singly or in combination. Steamed bone and other sources of calcium and phosphorus were investigated as supplements, and the most rapid growth rate was produced by 3 percent of steamed bone meal. One or 2 percent was fairly satisfactory, but with calcium carbonate and no steamed bone meal the ration was unsatisfactory. Autoclaved ground bone, U. S. P. tricalcium phosphate, and a defluorinated rock phosphate were effective substitutes. It seemed necessary for satisfactory growth to add some form of inorganic phosphorus to the soybean meal ration. Growth rate was increased and the incidence of perosis reduced by substituting wheat for corn in the soybean meal ration.

Studies of calcium and phosphorus metabolism in the chick.—III, Some time relationships in the action of vitamin D. E. W. MCCHESENEY and N. J. GIACOMINO (*Jour. Nutr.*, 29 (1945), No. 4, pp. 229-235).—Continuing this series (E. S. R., 92, p. 104), male White Leghorn chicks were shown to have a supply of vitamin D adequate for about 14 days of life. The Ca and P retentions reached a level of about 20 mg. near 100-gm. chick per day, which was maintained for about 3 weeks. Following this there was a decline to very low levels as the birds went into a state of terminal rickets. Oral supplements of 60 International Units of vitamin D₂ and 2,400 I. U. of D₃ produced an immediate increase in Ca and P retentions for about 6 or 8 days, after which they returned to the same low levels of retention. A second vitamin supplement of the same strength produced a similar positive but quantitatively smaller effect, probably due to the larger size of the birds. The increased level of mineral retention with supplementation was directly related to the amount of vitamin D available. Following a dose of 2,400 I. U., the body content of vitamin D₂ increased to about 1,000 I. U. but went to 250 I. U. in 10 days. The residue of about 6 I. U. of D₂ was rather tenaciously conserved. Experiments were conducted with 3 groups of 20 and 1 group of 40 chicks. The Ca and P balances and weights were calculated at 3-day intervals with and without the supplements.

The National Turkey Improvement Plan (U. S. Dept. Agr., Misc. Pub. 555, rev. (1945), pp. 26+, illus. 8).—A revision (E. S. R., 92, p. 408), bringing the plan up to date.

DAIRY FARMING—DAIRYING

Modern trends in dairy cattle feeding. K. L. TURK. (Cornell Univ.). (*Holstein-Friesian World*, 42 (1945), No. 23, pp. 24, 66).—A popular account of feeding dairy cattle, with special attention to high-quality roughages and hay in avoiding needs for higher proteins.

The value of the addition of fresh bakers' yeast to a normal ration for lactating dairy cows. C. L. NORTON. (Cornell Univ.). (*Jour. Dairy Sci.*, 28 (1945), No. 12, pp. 927-932, illus. 1).—With the type of bakers' yeast used in addition to the daily ration of cows, 20 to 80 gr. did not increase the fat percentage, the amount of fat produced, or the amount of 4 percent milk yielded over a 12-week period as contrasted with a control group of six cows over the 12-week feeding period. There was no beneficial effect on the appetite of the cows or injurious effect on their health.

Lactation in heifers induced by oestrogen implants. F. T. DAY and J. HAMMOND, JR. (*Jour. Agr. Sci. [England]*, 35 (1945), No. 3, pp. 150-157, illus. 3).—

Average lactation curves from a series of heifers treated with implants of stilbestrol and hexestrol for 60 to 100 days were prepared. Typically treated heifers came into milk from 1 to 6 weeks after implantation, which yield rose steadily thereafter to a maximum 60 to 100 days after treatment started. A rise in yield followed tablet removal. A heifer treated twice did not do as well on the second treatment. Nonbreeding heifers were made available by several commercial producers.

Changes in the level of vitamin A and carotene in the blood plasma of dairy cows associated with parturition and beginning lactation, T. S. SUTTON, H. E. KAESER, and P. A. SOLDNER. (Ohio Expt. Sta. and State Univ.). (*Jour. Dairy Sci.*, 28 (1945), No. 12, pp. 933-939, illus. 1).—The blood plasma carotene and vitamin A before and after parturition were tabulated in 28 cows of the four major dairy breeds. Both decreased markedly at the time of parturition and the beginning of lactation in 26 cows. The maximum decrease in blood plasma vitamin A occurred 3 days after parturition and amounted to 52 percent of the prepartum level. The total output during the first 3 days in the colostrum averaged for vitamin A 54,052 µg. for the Ayrshires, 35,858 µg. for the Guernseys, 62,332 µg. for the Holsteins, and 43,153 µg. for the Jerseys. For carotene the respective values were 50,922, 79,605, 55,690, and 39,896 µg.

Dairy cattle judging, A. B. NYSTROM (*U. S. Dept. Agr., Farmers' Bul.* 1769, rev. (1945), pp. 29+, illus. 21).—A revision (E. S. R., 88, p. 238).

4-H club manual in dairying—demonstration No. 1, the dairy calf, P. CARRUTH (*Ark. Agr. Col. Ext. Cir.* 382 (1944), pp. 8, illus. 4).—General directions for the care and management of dairy calves to 1 yr. of age.

Spaying dairying cows for more profitable milk-production, R. N. SHAW (*North Amer. Vet.*, 26 (1945), No. 5, pp. 274-276).

Some effects of thyroprotein on the composition of milk, J. G. ARCHIBALD. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 12, pp. 941-947, illus. 5).—In a study of the effect of 15 gm. of thyroprotein daily on the milk composition of 18 cows for periods of 6 weeks, milk was sampled at the start and twice during the feeding period and analyzed for total solids, ash, total protein, and casein, with determinations of lactalbumin, globulin, and lactose made by difference. There was a rather consistent decrease in the casein and a roughly proportional increase in lactalbumin and globulin. Changes in the fat content of the milk were not consistent. Variations in the composition between individuals within a breed were usually greater than variations between breeds. Wide variations in milk yield in response to the hormone were noted. The results should be considered tentative.

The preparation and effect of heat treatment on the whey proteins of milk, H. A. HARLAND and U. S. ASHWORTH. (Wash. Expt. Sta. et al.). (*Jour. Dairy Sci.*, 28 (1945), No. 12, pp. 879-886, illus. 2).—A method yielding a relatively undenatured and pure protein free from all substances foreign to milk by treatment of separated whey protein with NaCl and acidifying with HCl to pH 2 is described. The method yields lower whey protein and higher Ca values than the generally accepted method of Rowland (E. S. R., 79, p. 295). Treatment of the whey for 45 min. at 83° C. or higher temperatures for shorter periods denatured 93 to 95 percent of the whey proteins as determined by the NaCl-HCl method.

A study of Indiana butter, H. W. GREGORY and B. E. HORRALL (*Indiana Sta. Bul.* 504 (1945), pp. 20, illus. 11).—The trends in composition and quality of Indiana butter over a period of 9 yr. (1934-43) were investigated from the analysis of 4,751 samples for fat, moisture, soft curd, sediment, yeast and molds, and score. Part of the samples also had pH and mold mycelia counts made on them. There were seasonal variations in the butter compositions, and a gradual improvement was noted. The samples showing less than 80 percent fat decreased and those showing 80 to 81 percent increased, while those showing 81+ percent fat remained practically the

same. Much larger percentages of butter in the fall and winter contained less than 16 percent moisture than in other seasons of the year. There was a decreased number of samples with less than 16 percent and over 17 percent moisture. The salt content of the butter gradually decreased after 1935. The majority of butter samples contained 2 to 2.99 percent salt. Variations in the curd content were not significant, although the number of samples containing 0.9 percent curd and over was shown to increase during the last 2 yr. of the project. Approximately two-thirds of the butter samples showed yeast and mold counts between 11 and 500, but there was little difference between winter and summer months in this respect. Mold mycelia counts in 1941, 1942, and 1943 showed 82.4, 84.4, and 71.7 percent, respectively, of the samples with a 60 or less count. There was little correlation between mold mycelia count and the organoleptic method of grading butter, except in the 92 score samples. In averages for all seasons it was shown that the cooking grade has a 50-50 chance of being accepted as legal butter, as judged on the basis of mold mycelia count, but the 89 score butter has a 75 percent chance of being declared legal by the same test. Practically one-third of the 90 score butter had a mold mycelia count above the legal limit. A larger number of samples of butter had a pH of 6.5 to 7 than were found in a higher or lower pH, and the cream was standardized to a lower acidity. The temperature quality tests showed that a pH of 6.5 to 7.1 in the butter gave the best keeping quality. A satisfactory method for filtering and classifying sediment in butter was developed. The sediment was decreased over the period, and there was definite improvement in the percentages of samples which proved satisfactory in this test. The percentages of butter with a score of 90 or above gradually increased from 36.4 in 1935 to 69.1 in 1943. The percentage of 89 score butter gradually decreased during the first 4 yr. of the study and then remained constant to the end of the 9-yr. period.

The flavor of butter when manufactured from rancid cream, W. L. DUNKLEY and F. W. WOOD (*Canad. Dairy and Ice Cream Jour.*, 24 (1945), No. 7, pp. 25-28, 58, 60, 62).—Neutralizing rancid cream to 0.12 percent or less acidity may improve the quality of the butter made from it. Rancid cream was neutralized to various titratable acidities, pasteurized, and churned in both laboratory and semicommercial scale experiments, and the influence of neutralization on fatty acids and flavors of the butter was ascertained. In five experiments the flavor of the butter was improved as the neutralization was calculated as low as 0.05 percent acidity, but the flavor of two cream samples which gave butter with a clean flavor without neutralization did not improve on neutralization.

Use of an antioxidant in preventing hydrolytic rancidity in dairy products, I. A. GOULD. (Md. Expt. Sta.) (*Natl. Butter and Cheese Jour.*, 37 (1946), No. 1, pp. 40-41).—The addition of 0.75 percent and 1.5 percent Avenex Concentrate by weight to 30-35 percent cream greatly retarded lipolysis and rancidity developing in the butter from it, but 0.3, 0.6, and 0.9 percent Avenex Concentrate additions did not appreciably affect the lipolysis in the cream from subsequent homogenization. Various antioxidants may control naturally occurring rancidity but do not affect rancidity in which lipolysis has been accelerated by homogenization. These studies were conducted in two series of experiments with raw and homogenized cream with 0.75 and 1.5 percent Avenex Concentrate with storage of the butter for 3 or 5 weeks.

VETERINARY MEDICINE

The Royal College of Veterinary Surgeons, 1844-1944 (*Vet. Rec.*, 57 (1945), No. 51, pp. 599-677, illus. 5).—This centenary account reviews such matters as the progress of the veterinary art, the establishment of the college and its history, other veterinary institutions and services in Great Britain and overseas, and British veter-

inary periodicals and organizations. A brief section (pp. 657-658) is devoted to veterinary research.

Experiments on the transmission of anthrax through flies, S. K. SEN and F. C. MINETT (*Indian Jour. Vet. Sci. and Anim. Husb.*, 14 (1944), No. 3, pp. 149-158, illus. 2).—*Stomoxys calcitrans* failed to transmit anthrax to goats by its bites or by defecating on their scarified or cauterized skin. Both *Musca domestica* and *Calliphora erythrocephala* transmitted the disease when placed in contact with the cauterized skin of goats after having fed on incisions on carcasses of goats dead of anthrax. Anthrax was not reproduced by placing *M. domestica* in contact with the eyes of healthy goats. Anthrax organisms were not found on the mouth parts of *S. calcitrans*, but were found in the feces of this species not earlier than 21 and not later than 72 hr. after their infective feed.

Melanomata in domesticated animals, M. Y. MANGRULKAR (*Indian Jour. Vet. Sci. and Anim. Husb.*, 14 (1944), No. 3, pp. 178-185, illus. 5).—The tumors, benign and malignant, were collected from five gray horses, five mules, and three bullocks. One of the mules was brown colored and one bullock was black. A general histological structure is given, as well as the clinical records and autopsy findings. No attempt is made to clarify the histogenesis of these tumors.

Oral use of penicillin in treatment of experimental Erysipelothrix rhusiopathiae infection in mice, P. C. HARVEY, R. L. LIBBY, and B. B. WALLER (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 3, pp. 307-309).—In these studies, penicillin was shown to be of value in the protection of mice against experimental swine erysipelas infection. Oral administration was successful in the treatment of mice even without any protective action from oil coating, or buffers, provided it was instituted within 24 hr. after exposure. The use of penicillin in drinking water was as effective as its addition to the feed. Oral administration compared favorably with parenteral injection although larger amounts were required.

Synergistic action of nicotinamide upon penicillin, E. H. FRIEDEN (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 3, pp. 352-353, illus. 1).—High concentrations of nicotinamide were found to exert a synergistic effect upon penicillin inhibition of *Staphylococcus aureus*. Nicotinic acid was inactive in this respect. No evidence for a reaction between nicotinamide and penicillin could be found. Although the effect of nicotinamide appeared to be general for the three strains of staphylococcus tested, no effect could be demonstrated upon either *Streptococcus pyrogenes* or *Escherichia coli*.

Phenothiazine as an anthelmintic, H. M. GORDON (*Austral. Vet. Jour.*, 21 (1945), No. 4, pp. 90-95).—Tests with sheep and other data are discussed, from which it is concluded that "phenothiazine is a remarkable anthelmintic and its potentialities are as yet not fully exploited. Its high anthelmintic efficiency gives it a special place in preventive veterinary medicine, for, if used at strategic periods based on knowledge of the epidemiology of diseases due to worm parasites, it can prevent the increases in worm population which lead to outbreaks. There is still a great deal of work required on dose rates, toxicology, mode of action, and methods of administration."

Cytotoxicity of streptomycin and streptothricin, D. H. HEILMAN (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 3, pp. 365-367).—Several different preparations of streptomycin were tested on cultures of rabbit's spleen and were found to have a uniformly low toxicity for wandering cells and fibroblasts. Streptothricin had a relatively low cytotoxicity for leucocytes and macrophages but showed a fairly high cytotoxicity for fibroblasts.

Inhibition of Salmonella cultures by streptomycin, M. G. WEST, E. R. DOLL, and P. R. EDWARDS. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 3, pp. 363-364).—The in vitro inhibition of 412 cultures of *Salmonella*

by streptomycin was studied in all of the recognized types in the genus. Of the commonly occurring types, *S. paratyphi* A and *S. typhi* were the most sensitive, while *S. pullorum* and *S. enteritidis* were somewhat less susceptible. The remainder of the types which are found frequently were more resistant. The majority of the types required two to four times as much streptomycin to inhibit growth as did *Escherichia coli*. Different cultures of the same type often varied widely in their susceptibility to streptomycin.

Observations on the toxicity of *Rhododendron arboreum* to livestock, N. D. KEHAR and K. G. RAU (*Indian Jour. Vet. Sci. and Anim. Husband.*, 14 (1944), No. 3, pp. 177-178).—Leaves and flowers from two localities were fed to bulls, sheep and goats. One sample was definitely toxic and the other was not. The plant is not considered lethal.

Sôros, vacinas, alérgenos, e imunígenos [Sera, vaccines, allergens, and immunizers], A. BRAGA (*Rio de Janeiro: Author*, 1940, vol. 1, pp. 236+; *Min Agr., Serv. Inform. Agr.*, 1941, vol. 2, pp. 242, illus. 15; 1942, vol. 3, pp. 246, illus. 36; 1943, vol. 4, pp. 544, illus. 64).—This elaborate treatise is arranged largely on a basis of the various specific diseases. Each volume is supplemented by extensive bibliographies, and many of the chapters have French summaries.

Hoven—an expression of allergy? W. R. KERR and H. G. LAMONT (*Vet. Rec.*, 58 (1946), No. 1, pp. 6-7).—Discussing the results reported by Kerr and Robertson (E. S. R., 90, p. 394), the authors note that among the symptoms produced in sensitized cows by introducing antigen prepared from *Trichomonas foetus* into the uterus is an acute tympany of the rumen similar to that in animals consuming young red clover and other green crops. An allergic condition was indicated, and prompt relief followed the subcutaneous injection of adrenalin, usually from a single dose of 3 to 5 cc. Atropine sulfate in 0.5-gr. doses was also used with satisfactory results. The success of this treatment prompted its trial in cases of bloat following a feed of "clover or green corn or even on occasion young wet grass." Results were very satisfactory, although in some severe cases puncture was also employed.

Observation on the incidence of the common stomach worm, *Haemonchus contortus*, in young cattle in a Montreal abattoir, L. P. E. CHOQUETTE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 12, pp. 330-331).—Of 300 grass-fed calves and yearling cattle examined, only 2 were found to harbor *H. contortus* and both infections were of less than 100 worms.

Further experiments on the infectivity of vaccine prepared from *Brucella abortus* strain 45(20) for cattle, A. D. McEWEN (*Vet. Rec.*, 58 (1946), No. 1, pp. 3-6).—Continuing earlier work (E. S. R., 86, p. 247), experiments are reported and discussed from which it is concluded that vaccine prepared from strain 45(20) should be suitable for field use, since vaccination of nonpregnant animals was not found to cause the animals to excrete *B. abortus* from either the uterus or the udder. Serum agglutinins for *B. abortus* have not developed as a result of vaccination. It is noted, however, that the claim is not made that no nonpregnant animals ever will become infected by vaccination. One of 10 virgin heifers vaccinated after service proved to be infected, and "it must, therefore, be concluded that cattle possessing no acquired immunity to *B. abortus* infection should not be vaccinated at any time during pregnancy."

Action of penicillin against mastitis organisms in milk, H. W. SEELEY, JR., E. O. ANDERSON, and W. N. PLASTRIDGE. ([Conn.] Storrs Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 12, pp. 887-891).—The action of penicillin against common udder infections was tested in vitro in sterile milk and broth. Milk at pH 7 was as favorable a medium for penicillin action as buffered beef infusion broth. The mastitis organisms were arranged in the order of decreasing resistance to the action, *Streptococcus agalactiae* and *S. uberis*, *Staphylococcus aureus* and *Streptococcus*

viridans, *S. dysgalactiae* and *Corynebacterium pyogenes*, and the hemolytic group C streptococcus. All of these organisms were successfully rendered nonmotile in milk in vitro with small amounts of penicillin.

Observations on the permeability of the lactating bovine mammary gland to penicillin, C. A. V. BARKER and H. P. DUSSAULT (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 12, pp. 332-335).—From an experiment in which a lactating Holstein cow infected with mastitis streptococci was treated with a total dosage of 2,681,000 Oxford units administered intramuscularly in a beeswax-peanut oil base over a period of 4 days, it is concluded that this method is of no value in the treatment of chronic streptococcic bovine mastitis. This is ascribed to the fact that the lactating bovine mammary gland appears to be nonpermeable to penicillin. The results are deemed to confirm the observation of Bryan et al. (*E. S. R.*, 93, p. 73) and Seeley et al. (*E. S. R.*, 93, p. 770).

A preliminary report on the treatment of clinical and subclinical streptococcal and staphylococcal infections of the bovine udder with penicillin, D. MURNANE (*Austral. Vet. Jour.*, 21 (1945), No. 4, pp. 82-90, illus. 1).—In a preliminary trial extending over a period of 6 mo. and embracing 134 quarters of 60 cows in 10 commercial herds, penicillin administered by udder infusion proved effective in the treatment of streptococcal mastitis. A single dose eliminated infection from 37 percent of the clinical cases. Two doses eliminated infection from 72 percent of the clinical cases. Two subsequent doses in cases in which infection persisted raised the efficiency to 80 percent, and two further doses in the remainder resulted in an aggregate efficiency of 93 percent.

Staphylococcal infections with strains of normal penicillin sensitivity failed to respond satisfactorily to penicillin treatment. The role of penicillin in the control of mastitis is discussed, and the importance of intelligent cooperation by the farmer, a high standard of hygiene, and good milking methods are emphasized.

Progress in the control of mastitis, F. W. GRAVES (*Jour. Milk Technol.*, 8 (1945), No. 5, pp. 266-271).—A control program is presented and discussed.

Abortion in cattle and sheep, H. E. HARBOUR (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 57 (1945), pp. 16-40).—A review of the present state of knowledge of this disease and its control.

Copper deficiency in cattle and sheep: Occurrence and control in N. Z., I. J. CUNNINGHAM (*New Zeal. Jour. Agr.*, 69 (1944), No. 6, pp. 559-563, 565-569, illus. 2).—The purpose of this article is to outline the reasons that have led to the conclusion that a Cu deficiency exists in New Zealand and to describe the symptoms of Cu deficiency in dairy cattle, sheep, and pigs. Analyses for Cu of the pasture soils from deficient areas and of the Cu content of the livers and blood of calves, cows, lambs, and ewes are included. In cases of peat scours and enzootic ataxia much less than the normal amount of Cu was found in the liver and blood.

Suspected copper deficiency in cattle in Aberdeenshire, S. JAMIESON and F. C. RUSSELL (*Nature [London]*, 157 (1946), No. 3975, p. 22).—A condition similar to the peat scours noted above was observed in young cattle on a small Aberdeenshire farm newly reclaimed from heather. A Cu content of only 2.5 p. p. m. in the pasture was revealed. Two of the three affected animals survived after removal from the pasture and showed some improvement on drenching with Cu.

Control of trichostrongylosis in sheep (*Austral. Vet. Jour.*, 21 (1945), No. 4, pp. 116-119, illus. 1).—In view of an expected reduction in the supply of nicotine sulfate locally available in 1945 and 1946, the use of phenothiazine and tetrachloroethylene as substitutes is discussed as to methods of application, dosage, and disadvantages.

Antibody response of swine to vaccination with formalized swine influenza virus adsorbed on alum, I. W. McLEAN, JR., D. BEARD, A. R. TAYLOR, D. G.

SHARP, and J. W. BEARD (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 3, pp. 358-362, *illus.* 2).—In tests with swine, the antibody response to formalized swine influenza virus adsorbed on alum was essentially the same as that to the vaccine dispersed in saline solution. The chief influence of the alum was a brief delay in the peak response. The higher concentrations of alum lessened the primary antibody response, but the subsequent antibody levels and the rates of diminution in titers were nearly identical with the two sorts of vaccine.

An effective method for the control of trichinosis in the United States, S. E. GOULD (*Jour. Amer. Med. Assoc.*, 129 (1945), No. 18, pp. 1251-1254, *illus.* 3).—This is a discussion of the incidence of trichinosis in the United States, its morbidity and mortality, and the need of control measures. The methods considered are microscopic inspection, the cooking of garbage fed to hogs, and the processing of pork and pork products. It is maintained that "during the past 50 yr. very little progress has been made in the control of trichinosis in the United States," and that "the time will surely come when the public will insist that the pork which it eats, no less than the milk which it drinks, is safe for human consumption."

Zoologic and histologic modification of the distemper virus by ferret passage, R. G. GREEN. (Univ. Minn.). (*Amer. Jour. Hyg.*, 41 (1945), No. 1, pp. 7-24).—Upon serial passage through ferrets by spleen transfer, a canine distemper virus of high virulence for dogs, foxes, and ferrets became of extremely high virulence for ferrets and of very low virulence for foxes and dogs. After 50 passages the virus, on subcutaneous injection, produced only symptomless infections in young foxes and generally mild infections in dog puppies. Ferret-passage virus above the fiftieth generation, injected intracranially, failed to produce any symptoms in either foxes or dogs. The ferret-passage virus propagated by skin transfer developed some pathogenic properties for the ferret distinct from those of the spleen-transfer virus. It is concluded that the distemper virus seems capable of modification by animal passage both with respect to kinds of animal hosts and with respect to kinds of tissue cells invaded by the virus.

Effect of dietary changes upon avian malaria, M. M. BROOKE (*Amer. Jour. Hyg.*, 41 (1945), No. 1, pp. 81-108, *illus.* 6).—Canaries, pigeons, and ducks were fed various diets and infected with one of four strains of malaria (IH and IP strains of *Plasmodium relictum*, 3HI strain of *P. cathemerium*, and the 12A strain of *P. lophurae*). With the exception of a quantitatively reduced diet and one deficient in vitamin B₁, the experimental diets were high in carbohydrates and low in practically all other nutritional values as compared with the control diets.

In general, the birds on the experimental diets were found to have more severe primary attacks, greater tendency to relapse, and less resistance to superinfection. During their primary attacks they exhibited greater numbers of parasites, higher parasite peaks, and longer patent periods. In addition, there were more fatal infections among the poor-diet groups and the symptoms appeared to be severer.

In the experiments upon birds having latent infections with malaria, parasites reappeared in the peripheral blood of only those on the experimental diets. A diet essentially deficient in only vitamin B₁ did not provoke any malarial relapses in pigeons with latent infections, regardless of how severe the specific deficiency symptoms became, and it did not appear to lower their resistance to superinfection.

The immunity of superinfection was greatly reduced, or entirely broken, in over a third of the birds with latent infections that were on the experimental diets and in one bird on the control diets. In spite of its superinfection the one control bird demonstrated more resistance than the bird receiving the experimental diet. A pigeon that was superinfected while on a rice diet regained its immunity when returned to the stock diet for 11 days.

Failure of intestinal extracts to prevent chick gizzard erosions, R. E. GRAY, M. I. GROSSMAN, and H. E. ROBINSON (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 3, p. 387).—Attempts to use intestinal extracts which had been found effective in preventing jejunal ulcer in dogs proved ineffective when fed to chicks as 5 percent of a ration known to produce gizzard erosion.

Fowl plague in Egypt: Immunisation—mouse neurotropic fixed virus, Z. MORCOS (*Vet. Jour.*, 102 (1946), No. 1, pp. 3–11, illus. 1).—A review of the literature is followed by reports of experiments with mice and chicks in which fowl plague virus was passed through white mice by subdural inoculation. At the beginning the incubation period was 7 days; after the fifth passage the incubation period became fixed at 3 days. At the same time the virus became attenuated to fowls with a 6-day incubation period, instead of an average of 3 days. Dryness did not aid attenuation, but ether treatment definitely did so.

It is concluded that "feeding of fowl plague virus seems to require some accessory factor in order to cause the disease. To determine the minimum infective dose is difficult; it depends upon individual bird susceptibility and virulence of the virus. A large scale experiment is expensive, but it is hoped to test immunity by natural infective methods. The neurotropic mouse ether-treated virus is a promising antigen."

Early observations on antibiotic substances in *Penicillium glaucum* and other organisms against a virus, J. S. JOFFE. (N. J. Expt. Stas.). (*Science*, 102 (1945), No. 2659, p. 623).—On mold and bacterial contaminants destroying the fowl plague virus.

Studies on *Plasmodium gallinaceum* Brumpt, I, II (*Amer. Jour. Hyg.*, 41 (1945), No. 1, pp. 109–122).

I. *The incidence and course of the infection in young chicks resulting from single mosquito bites*, G. R. Coatney, W. C. Cooper, and V. I. Miles (pp. 109–118).—Data are presented on the infections that developed in 302 chicks less than 2 weeks of age, bitten by single mosquitoes (*Aedes aegypti*) infected with *P. gallinaceum* as proved by postprandial dissection. Of these, 290 birds survived for observation. These survivors exhibited an infection rate of 85.5 percent and a mean prepatent infection period of 8.63 ± 0.162 days. Of the 248 infected birds, 84.3 percent died, with all but one showing exoerythrocytic schizonts in the brain at autopsy. In the younger chicks studied, the infections ran a shorter course and were more often fatal than in the older birds, though infection rates and prepatent periods were similar in the two groups. It is felt that this parasite and host can be very useful for chemotherapeutic investigation, although a dependence upon mosquito bites for transmission of the infection has certain disadvantages which can be overcome by injecting the sporozoites mechanically.

II. *The incidence and course of the infection in young chicks following the inoculation of infected salivary glands*, G. R. Coatney, W. C. Cooper, and H. L. Trembley (pp. 119–122).—The procedure outlined in the above paper was modified in that the mosquitoes were first dissected and the isolated infected salivary glands inoculated mechanically. Strain 8A of *P. gallinaceum* was used throughout the study and the same strain of White Plymouth Rock chicks.

Data are presented on the infection that developed in 200 chicks, of which 97.5 percent became infected and 97.9 percent of these died. It is concluded that the mechanical introduction of isolated infected salivary glands is tedious and time consuming but highly effective in producing infections with this parasite and host.

An experimental study of mixed infections with *Plasmodium cathemerium* and *Plasmodium lophurae* in ducks, F. WOLFSON (*Amer. Jour. Hyg.*, 41 (1945), No. 1, pp. 123–135, illus. 4).—An attempt was made to determine the behavior of *P. cathemerium* and *P. lophurae* in mixed infections resulting from simultaneous inoculation of equal doses of parasites of each species. The evidence presented indicates that the two species in mixed infections develop independently.

It is also concluded that in mixed infections with *P. cathemerium* and *P. lophurae* semiweekly subinoculations of standard doses of parasites are likely to result eventually in a pure infection of *P. cathemerium*; it is regarded as possible that after a proper adjustment of doses, *P. cathemerium* and *P. lophurae* in mixed infections could be used for testing the effect of antimalarial drugs upon both species in a single individual dose.

Studies in pullorum disease.—VII, Transmission of infection to healthy birds by contact, R. GWATKIN (*Canad. Jour. Compar. Med. and Vet. Sci.*, 9 (1945), No. 12, pp. 335-338).—In this installment of the series (E. S. R., 94, p. 116) 51 chickens were placed in an infected group of the same age when they were 40 days old. Thirty-seven percent became reactors. *Salmonella pullorum* was recovered from 27 percent of those that died. Two of 10 adult males became positive when placed in the infected group. The presence of *S. pullorum* was not confirmed on bacteriological examination. Five of 17 adult females became infected by exposure in the same infected group. All were negative at 2 mo. One was positive and 2 gave slight reactions at about 4 mo., while at 5 mo. 4 more positives had developed. *S. pullorum* was recovered from all 5 positive birds. The experiment indicated that transmission of infection to clean birds in an infected flock is far from insignificant, as 26 of the 78 clean birds became infected.

Additional outbreaks of equine encephalomyelitis in New Jersey pheasants, F. R. BEAUDETTE and C. B. HUDSON. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc.*, 107 (1945), No. 825, pp. 384-386).—Additional cases (E. S. R., 85, p. 538) are described as encountered at various points in New Jersey. It is pointed out that in both 1940 and 1943 the disease was diagnosed in a pheasant but there were no reported cases in horses. In 1944 there were two cases in pheasants and only one case in horses.

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1943, parts 1, 2, 5 (*U. S. Geol. Survey, Water-Supply Papers* 971 (1945), pp. 613+, illus. 1; 972, pp. 503+, illus. 1; 975, pp. 412+, illus. 1).—These papers record stream-flow measurements for the year ended September 30, 1943, No. 971 covering the North Atlantic slope basins; No. 972 South Atlantic slope and eastern Gulf of Mexico basins; and No. 975 Hudson Bay and upper Mississippi River Basins.

Water levels and artesian pressure in observation wells in the United States in 1943.—Part 6, Southwestern States and Territory of Hawaii, O. E. MEINZER, L. K. WENZEL, ET AL. (*U. S. Geol. Survey, Water-Supply Paper* 991 (1945), pp. 305+, illus. 18).—This continues the series (E. S. R., 94, p. 261).

Federal-State cooperative snow surveys and irrigation water forecasts for Columbia Basin, January 1, 1946. (Coop. Mont. Expt. Sta. et al.). (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1946, pp. 12+, illus. 2).

Edificio di misura ad equazione di portata lineare [Measuring irrigation water by means of a device with linear equation], G. DI RICCO (*Riv. Catasto e Serv. Tec. Erariali*, 18 (1940), Nos. 3, pp. 293-309, illus. 7: 4, pp. 416-427, illus. 8).—This paper proposes a new type of measuring device for irrigation water, this having a hydrometric outlet based on a linear equation. Having defined in every detail and in its use this device, the author explains the theoretical and experimental procedure that he has followed in order to reach the calibration formula. Finally, considering some construction peculiarities of the mentioned appliance, he concludes by discussing the influence that these peculiarities can exert to change the ratio of dependence between discharge and hydraulic head on the edge of the outlet.

A method for designing vegetated waterways, V. J. PALMER. (U. S. D. A.). coop. Okla. Expt. Sta.). (*Agr. Engin.*, 26 (1945), No. 12, pp. 516-520, illus. 10).—

A preview of a graphical method for designing channel sections of vegetated waterways based on a variable (n) (retardance coefficient) developed from results of channel experiments.

Grounds maintenance, dust and erosion control: Repairs and utilities (*War Dept. [U. S.] Tech. Man. No. 5-630 (1945), pp. 78+, illus. 65.*)—This technical manual discusses the factors contributing to efficient maintenance of grounds occupied by posts, camps, and stations, and gives information and outlines procedures for post engineers and personnel engaged in grounds-maintenance work. It includes growth of vegetation; maintenance of lawns, recreational areas, and airfields; dust and erosion control; soil conservation and improvement; stabilization of grades, banks, and ditches; and post cemeteries.

Thermal conductivity of insulating materials at low mean temperatures, F. B. ROWLEY, R. C. JORDAN, and R. M. LANDER. (Univ. Minn.). (*Refrig. Engin., 50 (1945), No. 6, pp. 541-544, illus. 10.*)—The authors present data and discuss the results of laboratory tests for thermal conductivity of several insulating materials under controlled moisture conditions. Resultant percentage drops in conductivity upon lowering the mean temperature from 90° to -60° F. of the tested materials are as follows: (1) Corkboard (12.2 lb. per cubic foot density) 14.6 percent, (2) corkboard (8.0 lb. per cubic foot) 16.3 percent, (3) corkboard (6.5 lb. per cubic foot) 19.8, (4) wood fiber board 18.3, (5) cellular glass block 20.1, (6) silica aerogel 21.3, (7) mineral wool board 21.4, (8) redwood bark 29.8, (9) rock wool 35.2, and (10) glass wool 39.6 percent. Temperature conductivity curves plotted from the test data for each test material gave two interesting graph types: (1) In all cases of rigid materials tested the curves were linear over the entire range of tests, while (2) in all cases of loosely packed materials tested the graphs show a positive curvature. From an analysis of the prepared curves, together with the reported percentage drop in conductivity figures the greatest percentage drops occurred for those materials producing the nonlinear graphs. Thus, with the comparatively loosely packed fibrous materials it is probable that more radiant heat transfer occurs than in the closely packed rigid materials. Inspection of the data obtained for the tests of the three corkboard samples shows that the samples density varies inversely with the percentage drops in conductivity.

Although the amount of heat transferred across a rigid or flexible insulating material is generally determined by application of the laws of heat conduction and a predetermined conductivity coefficient, actually only a portion of the heat transfer is entirely by conduction. There is usually an appreciable amount of internal heat transfer by convection and radiation. The amount of heat transferred by radiation across an air space between parallel surfaces is proportional to the difference in the fourth power of the surface temperatures. Thus, radiation may be an important factor in the transmission of heat through a porous material, and this rate of radiant heat transfer will be much greater at high mean temperature than it will at low, even though the temperature difference is the same in both cases. Therefore, those insulating materials having the greatest amount of heat transferred by radiation will show the greatest change in conductivity with a change in mean temperature.

Prestretched reinforcing bars show high strength in University of Iowa tests, B. J. LAMBERT and M. L. ASHTON (*Civ. Engin., 15 (1945), No. 12, p. 564, illus. 2.*)—Experimental test results have shown rather conclusively that by using any type of commercial reinforcing bar, prestretched 10 percent beyond its ordinary length at the mill or warehouse, the strength of a beam or slab can be increased up to 50 percent or more beyond that of the same beam or slab in which the ordinary unstretched bar is used. It is stated that complete data of the records of the stress-strain relations and elastic behavior of the test beams are available upon request to the authors at Iowa City, Iowa.

1945 Supplement to A. S. T. M. Standards, including tentatives.—Part II, Nonmetallic materials—constructional (*Philadelphia 2: Amer. Soc. Testing Mater., 1945, pt. 2, pp. 231+, about 68 illus.*).—This supplement contains the newly adopted and revised standards and the new and revised tentatives in the nonmetallic constructional materials field that have been accepted since the appearance of the 1944 Book of Standards, Part II.

The structural application of glue in framing farm buildings, [I], II. (Iowa Expt. Sta.). (*Agr. Engin., 21 (1940), No. 2, pp. 47-50, illus. 12; 26 (1945), No. 12, pp. 507-510, illus. 7*).—In part I, H. Giese gives a general discussion of the adaption of glue to structural building members, together with a review of the glue application studies during the past 10 yr. He predicts that rigid construction employing glued joints with solid members in farm building construction is promising and will effect economies through the more effective use of materials and lower depreciation costs through longer structural life.

In part 2, H. Giese and S. M. Henderson report test results of casein glued joints of field-assembled structural building parts made to determine the strength of low-pressure casein glued joints held with nails during the curing period and the durability of casein glue as used in farm structures, and to establish design loads for field cured joints. All tests were made under shear loading typical of farm construction. Conclusions based on these tests results are as follows: (1) Casein glued joints cured by holding the surfaces together by nails failed at an average stress of 920 p. s. i. when loaded parallel to the grain, and at 430 p. s. i. for perpendicular loading; (2) joints of lumber with moisture content of less than 7 percent cured at 70° F. reached maximum strength in 18 hr., and 3 days were required for 11 percent lumber at 50°; (3) joints cured with no pressure were 60 percent as strong as those nailed; (4) Douglas fir, yellow pine, and white pine all produced satisfactory joints; (5) casein glue is of ample durability if protected from the direct action of water; and (6) design values for shear loading parallel and perpendicular to the grain of the wood are suggested as 430 and 215 p. s. i., respectively.

Report of the Administrator of the Rural Electrification Administration, 1945, C. R. WICKARD (*U. S. Dept. Agr., Rural Electrification Admin. Rpt., 1945, pp. 28*).—Statements concerning the agency's accomplishments during the past 10 yr. and what they have meant to the people of the United States, together with prospects of future developments in the field of rural electrification (*E. S. R., 93, p. 79*).

Knock ratings of gasoline substitutes, A. D. PUCKETT (*Jour. Res. Natl. Bur. Standards [U. S.], 35 (1945), No. 4, pp. 273-284, illus. 9*).—Using standard test methods and standard testing units the following results of knock ratings of gaseous paraffins and olefins through C₄ and of carbon monoxide, are reported: (1) The knock ratings of carbon monoxide and of the normally gaseous paraffins indicate they can be used successfully as fuel in either supercharged engines or in normally aspirated engines of considerably higher compression ratio than those currently available in automotive equipment; (2) the antiknock properties of the normally gaseous olefins are such that they can be used satisfactorily in present automotive engines; (3) ethyl alcohol-diethyl ether blends containing less than 45 percent by volume of ether should give relatively knock-free performance under conditions of steady operation; (4) acetone, ethyl alcohol, and normal butyl alcohol, either separately or in blends, are satisfactory fuels as far as antiknock value is concerned; (5) acetone or ethyl or butyl alcohols can be used to extend supplies of gasoline or can be blended with suitable petroleum naphthas to make motor fuels of satisfactory knock rating; (6) when up to 30 percent by volume of ethyl alcohol is blended with gasoline of 40 to 60 American Society of Testing Materials motor octane number, the improvement in knock rating is of the order of one octane unit for each percentage of alcohol; and (7) acetone, though higher in octane number when tested neat, is less effective in blends than is ethyl alcohol.

Farm machinery, C. CULPIN (*London, E. C. 4: Crosby Lockwood & Son, 1945, 2. ed. rev., pp. 516+*, *illus. 300*).—A revision of a book written for the farmer and the student of agriculture as a source of information concerning the construction, maintenance, and use of farm power implements and machinery (E. S. R., 80, p. 832).

Agricultural machinery (*Hawaii Sta. Bien. Rpt. 1943-44, pp. 42-43, illus. 1*).—Experimental testing of standard continental farm machinery for adaptation to Hawaii agriculture indicated that the effective use of most tools was limited in many locations due to topographic irregularities, comparatively small fields, and short rows. Direct tractor mounting implements seem the desirable type. Tests of the combine harvester indicate that it is of little use under Hawaiian conditions, since it is difficult to maneuver in the small fields and all grain crop maturing is uneven.

Brush mowing machines, M. B. COX. (Coop. U. S. D. A.). (*Oklahoma Sta. Mimeog. Cir. 154 (1945), pp. 4+*, *illus. 1*).—An announcement of brush removing attachments for power and horse-drawn mowers which have been proved and are standard stock items of machinery manufacturers. The author discusses overall machinery adjustments, brush removal operations, and gives parts lists for various commonly used mowers.

New developments in hay harvesting and curing, C. N. TURNER (*Agr. Engin., 26 (1945), No. 12, pp. 501-503, 510, illus. 4*).—In connection with the barn hay drier studies at Cornell University, it early became evident that better methods of hay curing ran hand in hand with easier methods of field harvesting and handling of the hay crops. The author reports the experimental results obtained using barn hay driers along with regular and the following special methods of making hay: (1) Buck rake and wind stacker; (2) field harvester and hay chopper; (3) pickup baler and conveyor; and (4) hay loader, truck, and hay chopper. On the basis of the importance of good quality hay and the favorable reports of two seasons, hay drier experiences indicate further hay harvesting and curing studies are justified. The following summary of the year's experiences are given:

(1) A method of curing hay by forcing air through it in the mow is sure to be adopted in some form or another; (2) farmers have expected too much of this system during this past year when especially difficult curing conditions existed; (3) the moisture content of the hay should be below 45 percent for long hay and 35 percent for chopped or baled hay in order to insure good quality on a barn hay drier using natural air; (4) generally speaking, hay of the proper maturity cannot be as successfully cured when cut and placed on the drier the same day as when it is cut one day and placed on the drier the next; (5) the hay should be more carefully distributed in the mow and should not be walked upon any more than is absolutely necessary; (6) the rate of air delivered by the fan for long hay can be 12 c. f. m. per square foot of mow floor where the farmer puts his hay on at the rate of 2 to 4 ft. per day, but should be increased to the 15 to 18 c. f. m. where he is equipped to put hay on the drier at the rate of 8 to 10 ft. per day, and the rate should be 16 to 20 c. f. m. for chopped or baled hay; (7) the fan rating should be such that the above-stated delivery will be available against $\frac{3}{4}$ -in. static pressure for long and 1-in. static pressure for chopped or baled hay; (8) the fan should be operated continuously during the early stages of curing on the drier, and after the first 5 to 7 days the fan can be operated on a time-switch control for 1 hr. between 10 p. m. and 7 a. m. to save power during the final stages of curing a given layer; and (9) when no time switch is used a single-pole, single-throw switch should be used with a magnetic starter instead of the push-button momentary contact station which will restore operation of the unit after a power interruption of short duration or momentary low-voltage conditions which may be caused by lightning storms.

Mechanical production of cotton, P. W. GULL and J. E. ADAMS. (Coop. U. S. D. A.). (*Mississippi Sta. Bul.* 423 (1945), pp. 14, illus. 7).—The authors report data on results obtained from replicated experimental cultural and harvesting methods used in the production and harvesting of cotton in 1944:

Checked or cross-plowed cotton outyielded drilled cotton, had longer staple, its seed was lower in free fatty acid and higher in grade, and the yarn was stronger and of equal appearance. Defoliation did not affect the yield or foreign-matter content of seed cotton, the grade of cottonseed, or the spinning value of the lint. It did, however, reduce the moisture content of seed cotton, lint, seed, and the moisture and free fatty acid content of the cottonseed. Defoliation slightly lowered the grade of hand-picked cotton, but raised machine-picked cotton 0.7 grade. Flaming v. hoeing showed no difference in the values obtained on seed cotton, lint, and spinning, but seed produced showed a highly significant difference for free fatty acid and significant difference for grade in favor of flaming. The mechanical cotton picker picked 85 percent as much cotton as did the hand pickers, and this seed cotton was materially higher in moisture and foreign-matter content. A reduction of three grades over that produced by hand picking resulted, but fiber length and strength was not affected by the operation. The seed of machine-picked cotton had a higher moisture and free fatty acid content with significantly lower grade than seed from hand-picked cotton. Although the picker and card waste was much greater for machine-picked cotton, spun yarns were stronger and equal in appearance for 22s, 44s, and 60s sizes when compared with hand-picked cotton.

A small separator for the recovery of milkweed floss and seed.—II, Performance of standardization, D. H. HAMLY (*Canad. Jour. Res.*, 23 (1945), No. 6, Sect. F, pp. 383-387).—Results of controlled experiments for performance standardization of the milkweed floss and seed separator (E. S. R., 94, p. 263) are given. By standardization of the mode of operation and of the treatment of the pods a demonstration of the existence of marked differences in the products from clone varieties of milkweed pods was possible. Both the experimental laboratory model and the larger portable model gave equally efficient performance and significant quantitative differences in clone varieties.

Forces and pole-whipping in tent-pulling machines, F. A. BROOKS. (Calif. Expt. Sta.). (*Calif. Citrog.*, 31 (1945), No. 2, pp. 42, 50-54, illus. 4).—The author reports field experience of mechanical tent-pulling operations performed with parallel-pole apparatus. Results of stress analysis tests of machinery and pole parts indicate that overall improvements are needed to reduce chassis warp and pole breakage. Diagonal bracing of the operating machine, together with the introduction of flexibility in the pole mounting through a hydraulic folding arrangement, is pointed out as a possible solution to the present machinery defects.

The direct-expansion system for cooling milk on dairy farms, R. L. PERRY. (Univ. Calif.). (*Agr. Engin.*, 26 (1945), No. 12, pp. 511-515, illus. 8).—The author presents a completely revised and up-to-date discussion of the direct expansion system for milk cooling. Experimental result data obtained from tests of typical installations show that: (1) The direct expansion system requires only one-half as much energy as the brine system; (2) in cooling 1 gal. of milk per minute a 1½ h.p. water cooled compressor is required, or a 2 h.p. air cooled compressor for cool climates and a 3 h.p. unit for a hot climate; (3) the water section of a surface cooler should be built of 1 in. tubes for milk loads less than 2½ gal. per minute with a surface area of 10 sq. ft. per gallon per minute for milk loads up to ½ gal. per minute and 9 sq. ft. per gallon per minute for milk loads above 1 gal. per minute; (4) freezing on the cooler can be prevented by installation of a constant-back-pressure control valve; (5) cooler performance is improved with a relatively constant rate of milk flow, and if milk flow rate is widely fluctuating 20 percent more compressor capacity and

surface cooler area is needed; (6) maximum economy occurs with lowest compressor speed for desired cooling temperature; and (7) since the refrigeration rate of the storage box evaporator is only a fraction of that of the milk cooler, it is desirable to have some means of reducing the compressor capacity between cooling periods or to install a separate small compressor on the box evaporator.

Studies on odor elimination in apple storage, C. R. GROSS and R. M. SMOCK. (Cornell Univ.). (*Refrig. Engin.*, 50 (1945), No. 6, pp. 535-540, illus. 8).—Using the sulfuric acid-ceric sulfate method for removal of certain types of odorous volatiles and the resultant quantitative evaluation of the totals absorbable for comparison of the values of various methods of odor elimination in apple storages, the authors report the following results of their experimentation: (1) Both temperature and humidity may affect the production of measurable volatiles from pine wood apple containers, but a 10 percent rise in humidity seemed to have a greater effect than a 10° F. rise in temperature; (2) with low relative humidity ozone was of some value in reducing the pine wood volatile level but was of no value with relatively high humidities; (3) activated coconut shell carbon was effective in reducing the volatile level produced by pine box wood at both low and rather high humidities; (4) additions of chlorine were ineffective in reducing the level of volatile materials of pine wood containers; (5) ozone treatment was ineffective in lowering the volatile levels produced by two esters, ethyl acetate and ethyl malonate; and (6) volatile materials arising from geraniol, an essential oil, were effectively removed by activated carbon but not by the ozone treatment used.

AGRICULTURAL ECONOMICS

Why farm earnings vary, G. A. POND. (Coop. U. S. D. A.). (*Minnesota Sta. Bul.* 386 (1945), pp. 28, illus. 8).—This study of management factors covers largely the same group of farms for which the records for the period 1928-32 were previously analyzed in Bulletin 314 (E. S. R., 73, p. 864). Only farms on which dairying was a major enterprise were selected for the study. The present study covers the period 1928-37, and includes from 11 to 256 (total 1,462) farm year records in each of 10 counties. Tables show by years the average total farm income, total expense, and operator's labor earnings; the average prices received by farmers for livestock and livestock products and paid for principal feeds; and the average highest, and lowest operators' labor earnings and the range of earnings. A chart shows the range of operator's labor earnings for each year. Analyses are made of the relations to earnings of the eight management factors: Size of business, choice of crops, intensity of livestock production, crop yields, butterfat production per cow, returns over feed from livestock other than cows, labor efficiency, and power, machinery, and building expense per work unit. Tables show the adjusted operator's labor earnings (average 1928-37) on the farms classified according to productive man work units, acreage, index of crop selection, animal units of productive livestock per 100 acres, index of crop yields, pounds of butterfat per cow, index of return over feed cost from livestock other than cows, index of productive man work units per worker, and index of power, machinery, and building expense. Other tables show for the classification groups by factors the average operator's labor earnings for each year and the relation of the factors to the other management factors studied. A chart shows the average adjusted operator's labor earnings on the farms grouped according to the number of management factors in which the farmer was above the average. The thermometer chart—a graphic device for illustrating the effects of the different factors on the earnings of individual farmers—is described and illustrated.

The average adjusted operator's labor earnings for the farms on which the farmers exceeded the average for different numbers of management factors were: None, \$445; one, \$864; two, \$1,204; three, \$1,507; four, \$1,634; five, \$2,243; six, \$2,471; seven, \$2,821; and eight, \$3,444.

Farmers' response to price in the production of potatoes, 1922-41, B. H. PUBOLS and S. B. KLAMAN (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, pp. 10+, illus. 4*).—Correlation analyses are made of the relationships of percentage changes in acreage to adjusted prices for potatoes, one and two years preceding, for the United States, for the 18 surplus late potato States, and for Idaho.

The coefficients of multiple correlations were: United States 0.874, 18 surplus late potato States 0.857, and Idaho 0.840. "Under conditions prevailing during 1922-41, potato acreage would tend to remain stable at adjusted prices per bushel of about 72 ct. in the United States, 66 ct. in the 18 surplus late States, and 40 ct. in Idaho. The lower prices for the 18 States and Idaho compared with the entire United States reflect the highly commercial nature of potato production in these areas and their greater distance to market. Acreage in each of the three areas fluctuated widely from year to year during 1922-41, approaching stability in only a few years. Prices higher than the equilibrium prices tended to be followed the next year with an increase in acreage, and prices lower than equilibrium prices with decreases. Furthermore, the greater the change in price, the larger the change in acreage the following year. A change of 10 ct. in price was associated with a change in the same direction of 3.2 percent in acreage in the United States, 3.4 percent in the 18 States, and 6.2 percent in Idaho. Using the above-indicated equilibrium prices as bases, a 10 percent change in price was associated with a change in the same direction of 2.3 percent in acreage in the United States, 2.3 percent in the 18 States, and 2.5 percent in Idaho."

Costs, returns, and practices in growing snap beans, Knox and Sevier Counties, Tennessee, 1942, H. J. BONSER and E. B. FICKEL (*Tennessee Sta., Agr., Econ. and Rural Sociol. Dept. Monog. 191 (1945), pp. 59+, illus. 28*).—Sixty-four growers of bush and pole snap beans were interviewed. The cultural practices, yields, and methods of marketing are discussed. Analyses are made of physical and labor inputs, cost of production, gross and net returns, etc., for the area as a whole and for five subareas.

Peach production costs in the Yakima Valley, Washington, 1943 and 1944, B. D. PARRISH (*Washington Sta. Bul. 467 (1945), pp. 12, illus. 2*).—Records of production costs for the 1943 crop year were obtained from 69 growers with a total of 811 acres of peaches. Comparable records for 1944 for 17 growers were used to indicate changes in specific cost items from 1943 to 1944. Analyses were made of the 1943 data to determine the costs per acre and per ton of different growing and harvesting cost items, the variations in costs, and the relationship of yield to costs and of size of orchard to yields and costs. A table shows the costs for 1944 grouped by yield and nature of the costs.

Total fixed and variable costs in 1943 averaged \$60 per ton or \$474 per acre. High production per acre was closely associated with low cost per ton. The average percentages of total costs for different items were labor, 52; operator's management and hired supervision, 18; materials, supplies, etc., 17; and interest and depreciation, 13. Size of business was not associated much with the differences in costs of production. Based on a 19.2 percent increase in over-all wage rates in 1944 over 1943, the estimated cost of production in 1944 with normal yields was \$69 per ton.

Seasonal peaks and valleys of milk production in the Pittsburgh milkshed, C. W. PIERCE (*Pennsylvania Sta., Jour. Ser. Paper 1297 (1945), pp. 32+, illus. 9*).—The causes of seasonal variations in the production of milk in the Pittsburgh milkshed are analyzed and the possible future developments, including remedial measures, discussed.

Wartime changes in milk distribution and in the consumption of milk, cream, butter, and oleomargarine in Vermont, T. M. ADAMS (*Vermont Sta. Bul. 527 (1945), pp. 30+, illus. 5*).—The information was obtained largely from interviews during June 1944 with 1,150 housewives in Burlington and two nearby villages,

Essex Junction (1,901 consumers in 1940) and Shelburne (188 persons in 1940). The attitudes of dealers toward continuation of every-other-day milk delivery after the war were learned during the summer of 1944 from 112 usable replies to a mail questionnaire sent to 400 milk dealers of the State. Some of the findings were:

If a saving of 1 ct. per quart were possible, 77 percent of the Burlington and 87 percent of the Essex Junction housewives having doorstep delivery of milk would be willing to have every-other-day delivery continued. If no saving were possible, nearly 50 percent would not be willing. Store purchases amounted to 42 percent of all milk purchased in Burlington, 23 percent in Essex Junction, and 67 percent in Shelburne. In Burlington, store purchases were 58 percent in the low rental areas and 14 percent in the high rental areas. The volume of doorstep-delivered milk was maintained with the inauguration of every-other-day retail deliveries, and store purchases increased due to the increased wartime consumption. All dealers replying in Burlington and nearly all in Rutland favored continuation of alternate-day deliveries. In smaller communities many were opposed. The number of dealers serving Burlington decreased about 50 percent from 1942 to 1944. While milk consumption in the areas studied was high and had experienced a wartime increase, it was below the level recommended for adequate nutrition. Nearly all the families had fresh milk but only about 20 percent purchased cream. In the areas studied the combined weekly consumption of butter and margarine was about $\frac{3}{4}$ lb. per person. Consumers in Burlington and Essex Junction purchased about two-thirds as much oleomargarine as butter. In Shelburne nearly twice as much was purchased. Butter consumption in the areas had declined more rapidly than in the country as a whole. The per capita consumption of butter in Burlington in 1944 was only half as great as in 1935-36. Margarine consumption increased faster than in the nation as a whole and more than doubled from 1935-36 to 1944. Only a small part of the wartime margarine use is expected to continue in the postwar period.

Wartime selling of fruits and vegetables, J. K. SAMUELS (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 86 (1945), pp. 31+*, illus. 4).—This study is concerned primarily with citrus fruits, apples, and potatoes. The data and information were obtained from the California Fruit Growers Exchange, the Rio Grande Valley Citrus Exchange, five citrus associations in Florida, six apple marketing cooperatives in Washington, and four potato marketing associations in Florida, North and South Carolina; from market summaries compiled by the Federal-State Market News Service; and from correspondence and interviews with officials of a number of other cooperatives, State extension and marketing specialists, and members of the industry. Topics discussed for each of the three crops are grades and containers used; sales practices—methods, types of sales, and kinds of buyers; and distribution by size of market. Transportation, member patronage, labor problems, price trends at shipping points and in New York City, and the need to prepare for postwar changes are also discussed briefly.

Our egg marketing job, F. E. MUSSEHL and H. C. FILLEY (*[Nebraska Sta.] Cir. 79-1 (1945), pp. 4*).—The eight services that must be rendered by the producers, or by some agency developed or employed by them, in transferring eggs from Nebraska farms to consumers in distant cities are described.

The freight rate structure and its effect on the price and movement of Northwest wheat, L. D. CANNELL (*Wash. State Col., Bur. Econ. and Business Res., Bul. 2 (1945), pp. 78+*, illus. 3).—Data are supplied and discussed on the present freight rates and regulations in wheat-producing areas in the northwestern part of the United States, the direction and volume of flow of wheat from the area, the technical and historical background of present rates, the effects of rates and regulations on price to the grower, and the principal rate controversies and their relation to the growers' interest.

Domestic cotton surplus disposal programs, E. H. OMOHUNDRO, N. B. SALANT, M. R. COOPER and L. D. HOWELL (*U. S. Dept. Agr., Misc. Pub. 577 (1945)*, pp. 51+).—"Government programs formulated to help reduce the cotton surplus included the financing of the distribution of cotton for relief and for low-income families, the making of payments for diverting cotton into new uses, government surveys of the utilization of cotton, and government financing of research designed to develop new and extended uses of this fiber. It is the purpose of this publication to give a brief review and analysis of several of these programs, in order to bring about a better understanding of them and to indicate something of their relative costs and benefits."

Statistics of jute and jute manufactures with a brief survey of the industry, H. G. PORTER and M. R. COOPER (*U. S. Dept. Agr., Bur. Agr. Econ., 1945*, pp. 116+).—Tables cover acreages, production, and yields per acre of jute; the production of different jute manufactures; the international trade in, consumption of, and stocks and carry-overs of raw jute and jute manufactures; the supply and distribution of jute in British India, 1917-40; prices of raw jute and jute yarn, fabrics, and bags in the United States, British India, the United Kingdom, and other countries; import duties in the United States and Latin American countries; and the jute industry—numbers of mills, looms, spindles, employees, etc. A discussion, followed by a glossary of terms, precedes the tables.

Land transfer and titles, 1920-1945: A list of references, A. M. HANNAY (*U. S. Dept. Agr., Libr. List 21 (1945)*, pp. 41).—Included are 294 references for the United States and the several States and 238 for different foreign countries.

Wages and wage rates of seasonal farm workers in special crop areas of Florida, February-March 1945, L. J. DUCOFF and M. J. HAGOOD (*U. S. Dept. Agr., Bur. Agr. Econ., Surveys Wages and Wage Rates in Agr., Rpt. 1 (1945)*, pp. 18+, illus. 1).—This first of a series of reports by the Bureau of Agricultural Economics presents the results secured from surveys of farm wages and wage rates, and is based on data for 1-week periods secured from approximately 1,000 citrus pickers employed by citrus packing houses in the main citrus area of Florida, from 406 strawberry pickers on a sample of 110 strawberry farms in Hillsborough County, Fla., and a sample of nearly 500 vegetable harvesters and other agricultural workers housed in W. F. A. labor supply centers in the winter vegetable area of Florida.

Wages and wage rates of seasonal farm workers in Maricopa County, Arizona and Imperial County, California, February-March 1945, B. B. REAGAN and W. H. METZLER (*U. S. Dept. Agr., Bur. Agr. Econ., Surveys Wages and Wage Rates in Agr., Rpt. 2 (1945)*, pp. 21+, illus. 1).—This second report in the series noted above covers the wage rates and earnings for a week of 778 lettuce harvesters in Maricopa County, Ariz., and 777 workers harvesting cabbage, carrots, citrus fruit, lettuce, and peas in Imperial County, Calif.

Wages and wage rates of seasonal farm workers in special crop areas of Louisiana, April-May 1945, L. J. DUCOFF and G. K. BOWLES (*U. S. Dept. Agr., Bur. Agr. Econ., Surveys Wages and Wage Rates in Agr., Rpt. 3 (1945)*, pp. 15+, illus. 1).—The third report of the series noted above. Data were obtained for selected weeks on the wages and wage rates of workers harvesting strawberries and picking and packing snap beans in the major producing areas of Louisiana.

Wages and wage rates of hired farm workers, United States and major regions, March 18-24, 1945, L. J. DUCOFF and M. J. HAGOOD (*U. S. Dept. Agr., Bur. Agr. Econ., Survey Wages and Wage Rates in Agr., Rpt. 4 (1945)*, pp. 56+, illus. 2).—This fourth report of the series is based on information on a national sample of 20,000 farms in 158 counties. It reports the information obtained in the first of three national surveys made in 1945, and covers the third week of March 1945. Analyses are made of the farms employing hired workers, the composition, hourly cash wages, time worked, daily, and weekly earnings and wage rates of the farm

workers. Appendixes discuss the comparability of the survey estimates with other available statistics and describe the method of making the survey.

Farm and manufacturing wages in Virginia, F. L. UNDERWOOD (*Virginia Sta. Bul.* 378 (1945), pp. 24, illus. 15).—A table included shows the annual indexes, 1909–43, of wages paid in all manufacturing industries in Virginia and in the industries grouped as follows: Tobacco, food, textiles, wood, metals, transportation, paper and printing, chemicals, leather, miscellaneous, and stone, clay, and glass. Charts included and discussed compare indexes for each group with those for all manufactures; the indexes of farm wages, farm prices, and manufacturing wages in Virginia; and the indexes of the purchasing power of farm wages and of manufacturing wages in Virginia. Other tables and charts show for Virginia for 1909–43 the dollar volume of output in agriculture and manufacturing, percentage distribution of dollar volume of output in manufacturing, and comparative size of manufacturing industries, 1934–38.

The aggregate value of the output of manufacturing as far back as 1910–14 was 80 percent greater than that of agriculture. In 1935–39 the output for manufacturing was practically seven times as great as that for agriculture in terms of 1910–14 dollars. From 1910–14 to 1935–39, the value of agricultural output in terms of 1910–14 dollars increased 16 percent, as compared with 343 percent for manufacturing output. In 1909 the index numbers (1910–14=100) of wages for the various groups of manufacturing industries ranged from 50 to 111 for the different groups, and that for all manufactures was 78. In 1943 the range was from 189 to 448, with that for all manufactures 268. The greatest increases were those in transportation equipment, paper and printing, tobacco, and textiles.

"The wages paid in manufacturing from 1910 to 1943 represent a markedly increasing quantity of manufactured articles at current prices, whereas no such increase is shown in the quantity of farm products equivalent in value to the wages of a hired man in agriculture. Farm wages generally represent a compromise between industrial wages and prices of farm products. On the one side is what the farmer must pay to get help in competition with industry; on the other is what he can pay on the basis of the value of his products. Increased manufacturing and increased efficiency in manufacturing make necessary increased efficiency on the part of the farmer if he is to be able to pay the higher wages demanded for farm help and stay in business. A high-labor-cost period will run hand methods, low yields, and small inefficient units out of business, despite the enlarged market that increased manufacturing would bring."

Seasonal variations in Virginia farm prices, F. L. UNDERWOOD (*Virginia Sta. Bul.* 375 (1945), pp. 46, illus. 48).—Tables and charts included and discussed show the monthly indexes of Virginia prices, usually for the periods July–June 1910–11, 1920–21, 1930–31, and 1940–41, for different grains; hays; potatoes, sweetpotatoes, apples, pears, and peaches; different kinds of tobacco, peanuts, cotton, cottonseed, cowpeas, soybeans, red clover seed, and lespedeza seed; different meat animals, chickens, and turkeys; different livestock products; and horses, mules, and cows. In the case of part of the commodities, comparisons are made in the prices in one or more other States. A table also shows the monthly indexes of the prices of the commodities for 1944–45.

Economic objectives of farmers' cooperatives, E. A. STOKDYK (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt.* 90 (1945), pp. 21+, illus. 6).—A general analysis of the economic objectives of farmers' cooperative associations and the means by which they are attained. The theory of market prices is briefly discussed.

Handbook on major regional farm supply purchasing cooperatives, 1943 and 1944, J. G. KNAFF and J. L. SCEARCE (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt.* 89 (1945), pp. 45+, illus. 1).—Part 1 presents information for the 18 major

regional farm supply purchasing cooperatives in 1943 and in 1944 as to date of organization, area of service, types of local outlets, volume of business, distribution of savings, and financial condition. Part 2 combines and analyzes the data in part 1 to show the general character and significance of the associations. A table also shows the values of supplies distributed in 1943 and 1944 by three major regional marketing-purchasing cooperatives.

Statistics of farmers' marketing and purchasing cooperatives, 1943-44 marketing season, G. WANSTALL (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 83 (1945), pp. 31+, illus. 3*).—Included are statistics by States, geographic divisions, and the United States as a whole as to number of associations, membership, volume of business, etc., of farmers' cooperatives formed to handle different commodities.

Cooperative seed marketing, T. E. HALL (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 87 (1945), pp. 31+, illus. 6*).—This report is intended primarily for cooperative leaders who have had little contact or experience with seed marketing problems and operating practices. A general perspective is given of cooperative seed marketing objectives, development, problems, and general operating practices, special emphasis being on the operating problems and practices.

Effect of the war on county farm bureau cooperative associations in Indiana, J. L. SCEARCE (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 88 (1945), pp. 35+, illus. 5*).—The study is based on annual audits for the 5 yr., 1939-43, of 70 associations broadly representative of the associations operating in the State. Analyses are made of the changes in business volume, operating condition, and financial status.

Farmers' cooperative periodicals, P. T. GARTSIDE (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 5, rev. (1945), pp. 29+*).—A revision of the list (E. S. R., 84, p. 265) as of September 1945.

The Agricultural Situation [November 1945] (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Situation, 29 (1945), No. 11, pp. 48, illus. 7*).—This annual outlook issue (E. S. R., 92, p. 570) is based largely on material prepared for the Twenty-third Annual Outlook Conference held in Washington, December 3-7, 1945. Summaries by members of the Bureau of Agricultural Economics outline what the outlook appeared to be in the middle of October 1945 for industry, for farm prices and income, for various farm commodities, for the pattern of production, for farm equipment, and for family living.

1946 Agricultural Outlook Charts (*U. S. Dept. Agr., Bur. Agr. Econ., 1945, pp. 111+, illus. 113*).—"The charts in this book have been selected as those most likely to be of use to extension workers in presenting the basic facts regarding the major crop and livestock industries and the food situation. They are intended as a supplement to the mimeographed reports on the farm outlook for 1946. The charts included have been brought up to date, using data that were available up to October 10, [1945]."

Postwar agricultural prospects, O. B. JESNESS (*Minnesota Sta. [1944], pp. 24+*).—Some of the factors which will affect postwar agriculture in the United States are appraised. Among those discussed are export and domestic market prospects, employment and business activity, improved nutrition, industrial outlets, adjustments in production, standards of living, the war debt, price relationships, inflation and price control, land speculation, postwar land settlement, governmental programs, parity price limitations, and recognition of the general welfare.

Controlling inflation, W. E. GRIMES (*Kansas Sta., Agr. Econ. Rpt. 28 (1945), pp. 13, illus. 1*).—A brief discussion of some of the possible actions of the people that will assist in controlling inflation in the postwar period. The behaviors during and following the Civil War and World Wars I and II are compared.

Foreign Agriculture [October-December 1945] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 9 (1945), Nos. 10, pp. 145-160, illus. 4; 11, pp. 161-176;*

12, pp. 177-192, *illus.* 1).—No. 10 includes the following articles: Some Wartime Agricultural Problems in the Soviet Union, by D. N. Prianishnikov (pp. 146-150), describing the problems connected with cotton, sugar beets, and fertilizers; The Cattle Industry of Colombia, by O. Moore (pp. 150-156), describing the cattle industry, the regional production patterns, the breeds, insects and diseases, transportation, marketing, and government aid to the industry; and United Kingdom Production and Marketing Policy for Hogs, by D. D. Jones (pp. 156-160), describing the prewar and wartime controls, the trends in hog numbers, and the official postwar plans.

No. 11 consists of an article, Organized Marketing of Export Commodities in Australia, by M. E. Wright (pp. 162-176), dealing with wool, wheat, dairy products, sugar, meat, and fruit. It shows the development of agricultural assistance in the inter-war period, summarizes the control assumed by the government over prices, production, and trade during World War II, and indicates the probable approaches to the solution of the postwar agricultural problems of Australia.

No. 12 includes an article on Colombian Agricultural Policy, by J. A. Hopkins (pp. 178-188), describing the development of the agricultural policy of Colombia, the departments of agriculture and livestock, the Caja de Crédito Agrario, Industrial y Minero, agencies for specific crops, and the National Supply Institute. The policies regarding the principal crops—coffee, bananas, rice, wheat, cotton, fats and lard, cacao, and sugar—are discussed. An article, Food and Agriculture in the Trieste Region of Italy, by V. B. Sullam (pp. 190-192), describes the agriculture, the prewar food position, and wartime and current food problems.

Agricultural production and trade by countries: Pre-war summary by commodities (*U. S. Dept. Agr., Off. Foreign Agr. Relat., 1945, pp. 134+*).—Tables show by countries for the leading agricultural products for typical prewar periods the acreages for crops and numbers for animals, the production, net exports or imports, and amounts available for domestic consumption.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agriculture: The science and practice of British farming, J. A. S. WATSON and J. A. MORE (*Edinburgh: Oliver & Boyd, 1945, 8 ed., rev. and enl., pp. 883+, over 150 illus.*).—In this eighth edition (E. S. R., 60, p. 686), the four parts cover the soil and its management, crops, farm livestock, and farm organization and management. "Although little more than a year has passed since the last revision of the text, many changes and additions have been made. Apart from trying, as usual, to embody the results of recent research, the authors' aim in this edition has been to extend the scope of the work so that it may meet the needs not only of students but of all those who are concerned with British farming."

Rural schools for tomorrow (*Washington 6: Natl. Ed. Assoc. U. S., Dept. Rural Ed. Yearbook, 1945, pp. 152, illus. 7*).—This is the second yearbook sponsored by the Commission on Rural Education and the War. Part I (pp. 11-20) consists of an article, Goals for Rural Living in America, by J. E. Butterworth. Part 2 (pp. 21-77) presents data pertaining to the major social and economic problems of rural people, in the following papers: Major Social Problems Affecting Education in Rural Areas, by E. deS. Brunner; Making Agriculture Pay, by S. W. Warren; Rural Income and Taxation as They Affect the Education Program, by J. W. Martin, G. D. Morrow, and H. A. Dawson; and Some Trends in the Rural Population of Significance to Education, by O. E. Baker and C. Taeuber. Part 3 (pp. 78-152) includes the following articles on the major problems of schools in rural areas: The Purposes and Work of Rural Schools, by E. G. Bathurst, F. W. Cyr, H. A. Dawson, B. Morgan, D. F. Smiley, and W. A. Smith; Attracting and

Holding Competent Teachers, by K. V. Wofford; Planning Effective Rural School Administration and Organization, by F. W. Cyr; The Coordination of Community Activities for Educational Purposes, by R. W. Roberts; Developing an Effective Program of Pupil Transportation, by J. E. Butterworth; The Educational Plant, by K. O. Broady and M. A. Stoneman; and Using State and Federal Funds to Equalize Educational Opportunities in Rural Areas, by L. L. Chisholm.

Instruction in agricultural cooperation and marketing at State agricultural colleges, C. E. ALLRED (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 192 (1945), pp. 34+, illus. 7*).—The description of courses in catalogs of the colleges furnished the basis for comparison of courses as to scope, emphasis, objectives, etc. This analysis was supplemented by personal interviews and correspondence.

FOODS—HUMAN NUTRITION

Index to the literature of food investigation, A. E. GLENNIE and J. L. H. KEUNEMAN [*Gt. Brit. Dept. Sci. and Indus. Res., Index Lit. Food Invest., 15 (1943), Nos. 1, pp. 1-86+; 2, pp. 87-158+; 3, pp. 159-238+; (1944), No. 4, pp. 239-316+*].—This annotated bibliography follows the same pattern as the previous volumes by Glennie and Alexander (*E. S. R., 91, p. 208*). The majority of articles abstracted were originally published during the years 1940-43. The original English, French, and Spanish articles generally were abstracted directly.

Chemical abstracts and other abstract sources are also listed for most of the German and Russian articles.

Food composition table for short method of dietary analysis (revised), E. G. DONELSON and J. M. LEICHSENING. (Minn. Expt. Sta.). (*Jour. Amer. Dietet. Assoc., 21 (1945), No. 7, pp. 440-442*).—The food composition table, previously worked out for a short method of calculating the nutritive value of diets (*E. S. R., 88, p. 275*), has been revised to include the more recent data on the vitamin values of foods. Values for average servings of various groups of foods are given in terms of weight, calories, protein, fat, carbohydrate, Ca, P, Fe, and vitamin A, ascorbic acid, thiamine, riboflavin, and niacin. Comparison of the short method with the usual long method, whereby each individual food is calculated separately, shows excellent correlation between the two methods.

The authors conclude "the short method has been found to result in a considerable saving of time without sacrificing accuracy. It should be pointed out, however, that the method is most satisfactory when applied to a varied diet."

Adaptation of short method of calculating the nutritive content of diets in rural areas of middle Tennessee, R. C. STEINKAMP, W. D. ROBINSON, and M. M. KASER (*Jour. Amer. Diet. Assoc., 21 (1945), No. 8, pp. 522-526*).—The short method of Donelson and Leichsenring (*E. S. R., 88, p. 275*) has been modified for use in calculating the nutritive value of diets in rural areas in Tennessee. Considerable variations in food patterns from those found in Minnesota where the original method was worked out, necessitated changes in food groups and values. Surveys in this area in Tennessee by Youmans et al. (*E. S. R., 89, p. 611*) have indicated certain foods were consumed in sufficiently important quantities to influence the calculations considerably, and require separate grouping. The principal foods were turnip greens, biscuits, corn bread, pork, legumes, and molasses.

The results have been tabulated and analyzed statistically. "The values obtained by the short method are compared with those obtained by the usual long method of dietary calculation for 80 one-day diet records and for 30 seven-day records. A comparison is also made of the calculated vitamin values and the values determined in the laboratory on duplicated diets for the 80 one-day records. Consideration is given to seasonal variation.

"It is concluded that the short method permits considerable conservation of time without loss of accuracy in dietary calculations. The errors introduced by use of a one-day computation are minimized by the use of a seven-day record of food consumption."

Traditional food preparation rules, D. DICKINS (*Mississippi Sta. Bul. 418 (1945), pp. 60*).—Interviews with homemakers in 1,158 families (698 white and 460 Negro) in four small towns in Mississippi revealed that all employed one or more cooking rules taught by mother or someone else in the parental home. A detailed analysis of the 1,499 food preparation rules taught showed that they fell in five categories as follows: "(1) Preparation rules which are in accord with practices now recommended by nutrition and food specialists; (2) preparation rules which are in accord with directions found in old cookbooks examined, but are now out-dated because of increased knowledge of nutrition or better technical methods or changes in processing; (3) preparation rules which are in accord with observation but not found in old cookbooks examined which are now out of date because of increased knowledge of nutrition or better technical methods or changes in processing; (4) preparation rules seeming to have little or no basis; and (5) preparation rules of the recipe type." The majority of the vegetable preparation rules fell in the fourth class, the most frequent of this type of rule being one that directed the cooking of new vegetables, particularly new potatoes, in such a way as to remove supposedly unhealthy qualities. Negro homemakers gave a number of rules classified in group 3, the most common one pertaining to the use of soda to tender vegetables. About 20 percent of the vegetables rules reported by the white women and 80 percent by the Negro women included a reason with the rule, such as to tender or cook quicker, to make more healthful, or to improve flavor.

The meat, poultry, and fish preparation rules were much fewer in number than the vegetable preparation rules, and fell more often into group 2. The majority of cake preparation rules were classified into group 4; the majority of bread preparation rules in group 1.

In a discussion of the significance of traditional food preparation rules for the home economist, it is pointed out that in working with older homemakers and those with less schooling it is important to learn everything possible about what they have been taught and to use this as a basis for the teaching program. It is suggested further that food preparation instruction should be presented as a changing body of information, in keeping with nutrition and food processing developments, and that practical reasons should be given for the rules taught and for changing "unscientific" rules in use.

Effects of aging, freezing rate, and storage period on palatability of broilers, G. F. STEWART, H. L. HANSON, B. LOWE, and J. J. AUSTIN. (*Iowa Expt. Sta. (Food Res., 10 (1945), No. 1, pp. 16-27, illus. 7)*).—Thirty-six broilers, after being killed, semiscalded, plucked, eviscerated, and quartered, were sealed in latex bags and divided into two groups prior to freezing, one group being held less than 2 hr. before freezing and the other cooled at 1.7° C. for 18 hr. before freezing. One-third of each group was frozen by one of the following methods: (1) In a dry ice-alcohol mixture at -67.8°; (2) in an air blast at -45.6°; and (3) in uncirculated air at -20.5°. After freezing and shipping, all the broilers were stored at -23.3° for the duration of the experiment. Tests were made 9, 37, 51, 65, and 79 days after slaughter. One bird from each of the six lots was thawed at 4.4-7.2° for 48 hr., the amount of drip measured, and appearance and odor scored. The quarters were cooked to an internal temperature of 85°; the livers were cooked in 75 cc. of water in the top of a double boiler for 15 min. Pieces of thigh, breast, and liver were judged for odor, flavor, tenderness, and juiciness. Fresh controls, killed, plucked, eviscerated at once and held at 1.7-4.4° for 24 hr., were used in each comparison.

Results showed that the fresh controls were consistently preferred to the frozen broilers for all palatability factors with the exception of tenderness of the thigh muscles.

Neither aging before freezing nor the three freezing rates used produced detectable differences on palatability scores.

Differences in scores between fresh controls and frozen broilers became highly significant for all factors only after 51 days of storage.

Histological studies also were made and photomicrographs are presented. The microscopic examination of the tissues showed that "both the rate of freezing and time of aging before freezing affected the histological appearance of the muscle fibers. All birds frozen at -67.8° within 2 hr. after slaughter had vacuoles within the fibers of breast and thigh muscles. . . . These vacuoles were considered an indication of intra-fibrillar freezing, ice crystals having formerly occupied the site of the vacuoles. Intra-fibrillar freezing also occurred in all breast muscles and half of the thigh muscles of broilers frozen within 2 hr. after killing at -45.5° . No intra-fibrillar freezing occurred in broilers frozen within 2 hr. after killing at -20.5° . In general, intra-fibrillar freezing did not occur in any broilers held 18 hr. before freezing, regardless of the freezing temperature used."

Influence of stage of maturity on the yield and quality of perfection peas, L. H. POLLARD, H. B. PETERSON, and E. B. WILCOX. (Utah Expt. Sta.). (*West. Canner and Packer*, 36 (1944), No. 6, pp. 19, 39, illus. 2).—The peas studied were first harvested when a maturity of about 80 degrees on the tenderometer was reached, and harvested each day thereafter for 9 consecutive days. Tenderometer tests were made immediately and at 2-, 4-, 8-, and 24- hr. intervals after vining. Samples for starch, ascorbic acid, and carotene content were washed, sealed in No. 2 cans under vacuum, and quick-frozen. Starch analyses were made after 2 months' storage; ascorbic acid and carotene determinations after 6 months' storage.

Results showed a yield of 1.45 tons per acre with a tenderometer reading of 83.0 and a starch content of 2.60 on the first day of harvest. An increase in yield to 2.89 tons per acre, tenderometer reading 165.5, and starch content over 6.30 percent on the ninth day of harvest was noted, the greatest change occurring in the last 3 days of the test. Ascorbic acid values were found to be highest the first 3 days, and leveling off for the latter part of the harvesting period. No appreciable changes in carotene content were observed throughout the test period. Tenderometer readings made at intervals up to 24 hr. after vining showed fairly consistent increases in readings, accompanied by changes in flavor which were especially noticeable after the 4 hr. holding period. The author concludes that it is important to test peas for tenderness as soon as possible after vining in order to avoid losses to the grower.

Use of peanut flour in baking, E. GREWE. (U. S. D. A.). (*Food Res.*, 10 (1945), No. 1, pp. 28-41, illus. 5).—Commercially prepared peanut flour, Spanish peanuts, and Virginia-type peanuts were analyzed. Average results in percentage (3 samples) for peanut flour were as follows: Moisture, 7.5; protein, 58.0; fat, 9.6; ash, 3.7; crude fiber, 2.1; total sugar (as sucrose), 7.3; other carbohydrates (by difference), 11.8; calcium, 0.074; phosphorus, 0.556; and iron, 0.0033. Composition of the Spanish-type and Virginia-type peanuts, respectively, was as follows: Shell, 20 and 29 percent; skin, 1.8 and 1.8 percent; germ, 3.4 and 1.7 percent; cotyledon, 75 and 67 percent; fat content of cotyledon, 49.5 and 46.3 percent. The protein contents in percentage of separated parts of Spanish and Virginia-type peanuts, respectively, were: Shell, 4.8 and 5.6; skin, 11.0 and 13.4; germ, 27.8 and 26.5; and cotyledon, 31.9 and 30.6.

Roasted peanuts, with skin removed, were finely ground and the resulting product, as well as the commercially prepared peanut flour, was tested in varying amounts in biscuits, muffins, griddle cakes, waffles, and cookies. Satisfactory products were

obtained with the proportion of peanut flour or ground peanuts as high as 50 percent. Bread doughs containing up to 40 percent peanut flour were also satisfactory.

The nutritive values of various breads containing different levels of peanut flour and other flours are presented in tabulated form. The data on food composition were calculated from material obtained from numerous scientific and commercial sources, and include protein, calcium, phosphorus, iron, thiamine, riboflavin, and niacin values for 100 gm. or half-pound portions of the various products.

The author concludes that "a half-pound portion of bread made from patent wheat flour contains 31 percent of the daily protein requirement for a man weighing 154 lb. ([about] 70 kg.), whereas bread containing 5, 10, 15, 20, or 25 percent peanut flour will furnish 41, 46, 51, 56, or 61 percent, respectively, of the daily requirement. Bread containing peanut flour will serve as a very satisfactory substitute for meat.

"Peanuts are high in calcium, iron, and vitamins compared with most other food products."

The effect of soy flour on the nutritive value of the protein of white bread, F. E. VOLZ, R.M. FORBES, W. L. NELSON, and J. K. LOOSLI. (Cornell Univ.). (*Jour. Nutr.*, 29 (1945), No. 4, pp. 269-275, illus. 1).—Weanling rats, suitably paired, were fed an adequate basal diet in which the main variable consisted of patent flour or white bread containing 3 percent whole milk solids with or without the addition of 5 percent full-fat soya flour. Statistically significant differences were observed, the grams of weight gain per gram of protein consumed being 20 percent higher for the wheat-soya bread than for the white bread diet—1.17 gm. v. 0.97 gm. When the flours only were compared, the average protein efficiencies were 0.80 gm. for white flour and 1.13 gm. for white flour plus 5 percent soya flour.

The biological value of protein was determined by the method of Mitchell (E. S. R., 90, p. 817). White bread gave a value of 43.3 as compared with 47.7 for the bread with 5 percent soya flour.

Thirty-three samples of breads, collected on the open market in 1942, were analyzed for milk solids. On a dry basis, values ranged from 0.34 to 6.20 percent with an average of 2.30 percent. Breads labeled as containing milk varied as widely and contained no more milk solids than breads which were not so labeled.

Tenderness of pastries made with different soy flours, C. GABEL and G. SUNDERLIN (*Oil & Soap*, 22 (1945), No. 10, pp. 271-272, illus. 1).—Using a basic formula, three series of pastry mixes were made to show variations in the tenderness of soya flour containing different percentages of fat. A Bailey shortometer was used for determining the mean breaking strength of wafers made from 12 batches of varying ingredients. In the first series of mixes, in which the added fat was constant, the mean breaking strength was greatest with the defatted flour and was less with the extracted flour containing 5 percent and 15 percent fat. The tenderness was approximately the same when the added fat was varied in the pastries made with soya flour containing 0, 5, and 15 percent fat. There were no differences in the mean breaking strengths of the pastries made with the defatted flour containing varying amounts of soybean oil used to replace the fat in the formula. Pastries made with the expeller-type flour were more tender than the extracted-flour pastries containing as high as 22 percent fat. This study furnishes evidences that fat in the flour is effective as a shortening agent in pastries made with soya flour.

Experiments with guavas, W. V. CRUESS, L. A. HOHL, M. A. JIMENEZ, S. NICHOLS-ROY, R. TORRES, and M. ZORILLA. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 9, pp. 263-266, 283, 285, illus. 3).—In the raw outer flesh of the 25 varieties of fresh guavas analyzed for vitamin C, the content ranged from 55 to 529 mg./100 gm. Three varieties were analyzed for vitamin C content, fresh and after freezing in sirup, storing several weeks, and thawing. The content ranged from 235 to 480 mg./100 gm. in the fresh to 176 to 273

mg./100 gm. after freezing. Vitamin C determination on the raw and canned guavas showed the Rolfs variety to be highest in both the fresh (480 mg./100 gm.), and the canned (242 mg./100 gm.). The average moisture content for all varieties was approximately 88 percent; acidity was 0.55–0.60 gm./100 gm. In pH value, the juice of the Herradura variety was lowest (3.0), and the Giza variety was highest (4.29). Possibilities for using guavas in a jelly confection, jam, jelly, pies, ice cream, milk shakes, nectars, and as blends with other fruit juices are discussed. Experiments with dehydration, canning, and freezing guavas are cited.

Production of quality apple butter with good yield, C. S. NEVIN and H. H. MOTTERN. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 8, pp. 228–230, 253).—"A tart, full-flavored apple butter of rich-brown color and smooth semi-solid consistency can be produced by using a weight ratio of sugar : sauce : boiled cider of 1 : 6 : 6, calculated according to Federal Standards methods, and by cooking to a final concentration of 50 to 53 percent soluble solids. A yield of 8 to 9 qt. of apple butter per bushel of apples is obtained, and the time of cooking is reduced to approximately one-third that required by the 'old-fashioned Pennsylvania Dutch' method.

"A darkened sauce for the butter can be obtained by grinding the apples and agitating the ground raw pulp. During this oxidative browning, conditions are possibly more favorable for the extraction of pectins, which would account for the better 'body' of the finished butter. A desirable dark color and caramelized flavor can be quickly developed by overcooking the butter to a high concentration and then thinning to the final concentration with a portion of the sauce and cider reserved for this purpose."

Quality control of processed vegetables starts in the field, A. G. B. BOUGUET. (Oreg. State Col.). (*Canner*, 101 (1945), No. 23, p. 15, illus. 1).—"The quality of processed foods begins in the primary stages of production, and the omission of any one factor which affects a crop may prove the difference between success and failure. The importance of this fact is pointed out in reviewing the case of a grower who did not borate his cauliflower crop and discovered boron deficiencies at harvest time.

Sulphur dioxide solution as a preservative for fruits and vegetables, J. G. WOODROOF and S. R. CECIL. (Ga. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), Nos. 1, pp. 15–18, 25, illus. 2; 2, pp. 47–52, 57, illus. 6; 3, pp. 72–76, 89, illus. 6).—Essentially noted elsewhere (E. S. R., 93, p. 681).

Procedure for pasteurizing pickle products, J. L. ETCHells and I. D. JONES. (N. C. Expt. Sta. coop. U. S. D. A.). (*Glass Packer*, 23 (1944), No. 7, pp. 519–523, 546, illus. 6).—"Pickle products are classified as (1) fresh or unfermented, (2) partially fermented, and (3) fully fermented. "Pasteurization is required for the first group to prevent fermentation from taking place; in the second group, to stop the fermentation under way; and in the third group, to protect against further growth of organisms or from the action of fermentation byproducts that may reduce the firmness of the pickle during storage."

A brief description is given of the preparation of various types of pickles: Fresh slices, fresh dills, fermented dills, and genuine dills. Illustrations of several kinds of pickles, methods of preparing temperature control jars, and ways of batch or continuous pasteurization are included. The authors recommend a final vacuum of less than 10 in. of mercury for the best results. Detailed descriptions of methods of pasteurization are given. Emphasis is placed upon rapid heating of the can to an interior temperature of 165° F. with maintenance at that temperature for 15 min., followed by a rapid cooling to below 100°.

The importance of care in the pasteurization of pickle products, J. L. ETCHells and I. D. JONES. (N. C. Expt. Sta. coop. U. S. D. A.). (*Canner*, 98 (1944), No. 9,

pp. 28, 64).—A brief discussion of material essentially noted elsewhere (E. S. R., 87, p. 19; 88, p. 155).

Why and how to blanch, W. F. ROBERTSON. (Mich. State Col.). (*Quick Frozen Foods*, 7 (1945), No. 11, p. 90, illus. 3).—Blanching is defined here as the heating of materials to be preserved in steam or hot water at a desired temperature for a desired length of time. Blanching destroys enzymes, gives the product an additional wash, drives off gases, washes away bacteria and spores of bacteria which cause decomposition after thawing, removes skins, sets liquids in certain fruits and vegetables, helps to retain vitamins, and makes way for easier packaging. A quick cooling in cold water after 190° to 200° F. blanching temperature checks the heat at the proper time, thus making freezing faster and more economical.

Nutritive value of brined and fermented vegetables, I. D. JONES and J. L. ETCHells. (N. C. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Pub. Health*, 34 (1944), No. 7, pp. 711-718).—A general discussion is given of various types of brining, the different vegetables which can be used, and recent literature covering the effect of brining on the nutritive value of the food and the retention of vitamins.

Original data are presented on the ascorbic acid content of cauliflower after 7 months' storage in brine. In a 5 percent brine solution containing vinegar or lactic acid, unblanched cauliflower will retain approximately 60 percent of its original ascorbic acid.

The authors conclude that the greatest conservation of nutrient solutions is obtained when vegetables are preserved in strong brines and used so as not to require desalting, as in soups or certain vegetable mixtures.

"In the absence of desalting, the total protein retention is high, and mineral losses are small; carotene retention is fair, and thiamine and riboflavin may be present in significant amounts. The sugars and ascorbic acid are generally lost during the fermentation period and during brine storage.

"When desalting is practised in the preparation of brined foods for table use, somewhat greater losses in protein and minerals may be encountered. The desalting operation will effectively reduce the concentration of the sugars, ascorbic acid, and probably the B vitamin to a very low level."

Salting beets, carrots, corn, green beans, and spinach, F. W. FABIAN and C. K. WADSWORTH. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 8, pp. 231-237, 247).—Five vegetables were treated with low and high percentages of salt, with and without the additions of various amounts of acetic acid, and chemical, bacteriological, beta carotene, and ascorbic acid data were obtained. The influence of various operations on the ascorbic acid in blanched corn caused a loss ranging from 77 to 94 percent, while the carotene content was not appreciably affected. The physical characteristics of corn and green beans were least changed when blanched and preserved in 18 percent salt. Preserving green beans in 18 percent salt caused a carotene loss of approximately 25 percent, and ascorbic acid retention was 0.2 mg./100 gm. Carrots washed, diced, and blanched before treating with salt (18 percent by weight) and 0.3 percent acetic acid compared favorably with carrots canned from the same lot. The color, consistency, and flavor of cooked spinach preserved in 18 percent salt (with or without acetic acid) were similar to those of the canned spinach. It appeared from the results of the vitamin determinations reported that salting is not conducive to the retention of carotene and ascorbic acid in carrots and spinach. Beets may be successfully salted whether or not blanched; however, the best flavor results were obtained from the blanched vegetables as salting does not inactivate the catalase and peroxidase enzymes which causes flavor deterioration.

Freezing preservation of food products, L. O. VAN BLARICOM and C. L. MORGAN (*South Carolina Sta. Cir.* 71 (1945), pp. 14).—General recommendations

are given based upon the best methods of freezing preservation which have been developed by various experiment stations, then tested and adapted by this station.

Freezing rapidly at 0° F., packaging in moisture-vapor-proof containers—if possible—the use of only high quality foods, and the proper preliminary blanching of vegetables are recommended. Packaging of fruits including dry pack, sirup pack, and sugar pack, using various proportions of sugar, are discussed. The addition of lemon juice, citric acid, ascorbic acid, or a sodium bisulfite solution to prevent discoloration in apples or peaches is suggested.

A comprehensive table lists the suitable varieties of fruits and vegetables studied, and includes information on adaptability for freezing, preparation, blanching or pretreatment, type of pack, and recommended containers.

The following vegetables were considered good or excellent frozen products: Asparagus; green, wax, and lima beans; beets; broccoli; carrots; cauliflower; corn; kale; mustard greens; okra; peas; peppers; spinach; squash; and turnip greens. Eggplant proved to be poorly adaptable to freezing.

Of the fruits studied, only cantaloups, muscadine grapes, and plums gave unsatisfactory products. Good to excellent ratings were found for apples, apple cider, blackberries, blueberries, dewberries, raspberries, strawberries, cherries, figs, peaches, and persimmons.

A brief but thorough description of the preparation for freezing of poultry and eggs is also included.

Freezing preserves many, but not all, cooked foods, J. G. WOODROOF and I. S. ATKINSON. (Ga. Expt. Sta.). (*Canner*, 101 (1945), Nos. 20, pp. 24, 26, illus. 2; 21, pp. 30-34, 42, illus. 1).—Essentially noted elsewhere (E. S. R., 94, p. 400).

Constant experimentation results in new products, L. A. HOHL. (Univ. Calif.). (*Quick Frozen Foods*, 7 (1945), No. 11, pp. 52-53, 73, illus. 2).—Statistical evidence supports the belief that frozen foods have become increasingly popular in recent years. This author reviews the experimental work done on the freezing of foods and points out future possibilities for frozen products. "Quick," "slow," and "sharp" freezing terms are defined and discussed. Selection of suitable varieties, proper field handling of raw material, grading, automatic control of various process stages, and bacteriological and packaging controls are factors which pave the way for quality in frozen foods. Due to experimentation, the list of foods suitable for freezing has been considerably extended. Recent developments include freezing precooked foods; nectarines, persimmons, whole or sliced figs, baby food, fruit punches, and whole fruits frozen in lug boxes for use in subsequent canning are further possibilities for the frozen food industry.

Preparation of sweet potatoes for freezing, J. G. WOODROOF and I. S. ATKINSON. (Ga. Expt. Sta.). (*Locker Operator*, 5 (1944), No. 9, pp. 14, 31, illus. 2).—The method described, involving grading, peeling, cooking, pulping, packaging, and freezing, has been presented in greater detail elsewhere (E. S. R., 91, p. 481).

Better frozen berries for the locker plant, F. P. GRIFFITHS. (Mass. State Col.). (*Quick Frozen Foods*, 6 (1944), No. 12, pp. 50, 77, illus. 1).—A brief discussion is given of the more important variables affecting the quality of frozen berries. The varieties used are influenced by the localities where they are grown. Maturity and freshness are of prime importance, and firm, ripe, evenly matured, well-developed fruits are best. The method of preparation, whether whole, sliced, or crushed berries, varies with the type of berry and the use to be made. Materials added before freezing include various sugar mixtures as desired, and the use of pectin or calcium chloride brine dip to reduce drip. The method of packaging varies from a heat-sealed carton to a glass jar or tin can depending upon the space and equipment available. Maximum firmness and minimum of drip in the fruit is obtained by extremely rapid freezing; freezing at -10° F. is considered essential. A storage temperature of 0° or below, with little fluctuation, is recommended.

Thawing of the frozen berries is best accomplished by removal from the freezing compartment about 4 hr. before use and placing in the lower part of the refrigerator. The product then thaws slowly, stays cold, and retains maximum freshness.

Causes and control of discoloration in dehydration of white potatoes, Parts [I]–[III], J. S. CALDWELL, B. C. BRUNSTETTER, C. W. CULPEPPER, and B. D. EZELL. (U. S. D. A.). (*Canner*, 100 (1945), Nos. 13, pp. 35–39, 112–122; 14, pp. 15–16, 18, 30–32, 34; 15, pp. 14, 16, 24, 26–27).—This article summarizes 106 literature references in the fields of biochemistry, plant physiology, and phytopathology and integrates them with the results of previously unpublished studies of the causes and possible means of control of white potato discoloration. The literature reviewed deals with the normal color of potato flesh in relation to maturity; enzymically induced discolorations due to: (1) Chemical reactions occurring spontaneously when certain chemical compounds are brought together under conditions of concentration, moisture, and temperature; (2) growth or storage as a result of bacterial, fungus, or virus disease; (3) nonparasitic causes; (4) varietal differences; and (5) preparations of raw stock for dehydration (lye or flame peeling, cutting, spreading on trays, and blanching).

Applications of cold water, nontoxic chemical agents, acidifying agents, and sulfur compounds are effective in reducing or inhibiting the enzymatic discoloration. Non-enzymatic discolorations, resulting from (1) contact of the potatoes with metals or alkalies, (2) improper drying procedure, or (3) the moisture content, the relative humidity of the atmosphere of the container, and the temperature during storage are initiated by one or more enzymes and are preventable if sound material is so handled in processes of preparation that the action of the enzymes is inhibited.

"Enzymic discoloration in the potato is due to the action of an enzyme, tyrosinase or phenoloxidase, upon the amino-acid tyrosine in the presence of catechol and oxygen to form a reddish compound, hallachrome, which by further spontaneous changes is converted to a black end-product, melanin. The enzyme and the substances upon which it acts are normal constituents of all potatoes, but reaction does not occur until they are brought together in presence of oxygen, when some degree of activity and resulting discoloration will invariably occur, at temperatures permitting enzyme activity, unless means of prevention are employed."

Sanitary care and handling of food, F. W. TANNER. (Univ. Ill.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 3, pp. 137–141).—This paper, presented as an address, discusses the development of substances which cause food poisoning and infection through careless handling of foods. In a review of 54 literature references, the author cites Federal, State, and municipal ordinances, codes, and laws which exist, but are not sufficiently enforced, to handle the situation. The need of educational campaigns for food handlers to explain what bacteria are and how they are disseminated is emphasized.

Good dishwashing practices are complicated because human beings are unable to handle hot tableware with comfort. When properly operated, the dishwashing machine is a potent germ killer. "The [Illinois] ordinance and code regulating eating and drinking establishments recommends immersion of dishes for 2 min. in clean hot water of at least 170° F., or for ½ min. in boiling water, and/or immersion for at least 2 min. in lukewarm chlorine bath containing at least 50 p. p. m. available chlorine if hypochlorites are used, or a concentration of equal bactericidal strength if chloramines are used. These have been found to be bactericidal if rigidly adhered to."

Illustrations of the ineffectiveness of cooking as a means of sterilizing food include cooking of meat at low temperatures, and egg and fish cookery methods. "It is important to point out that foods which have been most troublesome in staphylococcus food poisoning are those which are semiliquid, such as custards, hollandaise

sauce, puddings, soups, salads, and comminuted meat products—rich nutrient media through which the organism easily spreads.” Insecticides, often confused with baking powder and flour, are causes of mass poisonings.

High-level food consumption in the United States. W. W. COCHRANE (*U. S. Dept. Agr., Misc. Pub. 581 (1945), pp. 48, illus. 6*).—“The definition of high-level food consumption developed here takes into account two principal considerations: (1) What foods people need nutritionally to sustain good health and (2) what food people would like to consume as indicated by consumption in the higher income brackets. . . . The implications of achieving the high level of food consumption are then analyzed: (1) To determine the effect on American diets, (2) to ascertain the income effects to the national economy and to agriculture, (3) to obtain a rough measure of the production adjustments involved.” The ways and means of achieving the high level of food consumption are reviewed and discussed.

The first year's findings in the NCA-CMI nutrition program. R. W. PILCHER (*Fruit Prod. Jour. and Amer. Food Mfr., 24 (1945), No. 9, pp. 271-274*).—This review summarizes the work done on the nutritive value of 32 different canned products which was initiated by the National Canners Association and the Can Manufacturers Institute. The ascorbic acid and carotene analyses were performed at the Arizona Experiment Station; determinations of thiamine and niacin were made at the University of Wisconsin; riboflavin and pantothenic acid at the University of Texas. Distribution of the water-soluble vitamins in the solid and liquid portions of the canned fruits and vegetables and the vitamin retention during preparation and serving of large scale cooking was determined at the University of Chicago.

Nutritional condition of children in relation to school lunches in two South Carolina rural communities. A. M. MOSER (*South Carolina Sta. Bul. 359 (1945), pp. 54, illus. 4*).—Children in two rural elementary schools in the upper Piedmont of South Carolina were observed for a period of about 1½ yr. In the winter school sessions in this interval, children in the one school were served a complete hot lunch while those in the other school received only a partial lunch consisting of foods that could be served without cooking. The detailed report of the study here presented considers the food supply at school in relation to that observed at home, the school attendance and school attainment, and presents a detailed account of the physical condition and growth of the children and of the results of blood analyses. The results of the study are summarized briefly as follows: “A higher proportion of the complete lunch group than of the partial lunch group made unusually good gains in height, a result thought to be especially significant since most of the children were short for their age compared with children in a nearby college community and with American children measured recently in a large-scale study. At the end of the period, an experienced pediatrician found that a greater proportion of the complete lunch group had the outward physical signs of good nutrition. A somewhat larger proportion of the children receiving a complete lunch than of those having a partial lunch at school improved the trend of their physical growth and development, and a smaller proportion of them lost ground during the period of study. The group receiving the complete lunch had maintained hemoglobin levels in spite of increased demand for blood-building materials during growth, whereas the other group had hemoglobin values significantly lower at the close than at the beginning of the study. However, in both groups average hemoglobin values were lower than those found among children in the college community.”

“There is need for improvement in the growth and nutrition of many South Carolina children. The school lunch, while it alone cannot correct long-standing malnutrition, can play an important role in immediate improvement of the food intake of school children and in the nutrition education program which should have far reaching and lasting effects. A special problem is presented by the small rural

school which lacks sufficient space, equipment, and staff for service of a complete cooked meal. Further experimentation is needed to develop plans for serving acceptable, highly nutritious, easily prepared lunches adapted to conditions in schools of this type."

Nutritive properties of pork protein and its supplemental value for bread protein. R. HOAGLAND, N. R. ELLIS, O. G. HANKINS, and G. G. SNIDER (*U. S. Dept. Agr., Tech. Bul. 906 (1945), pp. 12*).—Experiments were made to determine the digestibility and biological value of the protein in various cuts of pork. Hams, loins, picnic shoulders, and shoulder butts were obtained from hogs weighing approximately 200 lb. at slaughter. The meat used was roasted (whole or after being ground) at 325°–350° F. to an internal temperature of 155°–160°. The lean meat was mixed with the juice, ground, and dried at 155° to a moisture content of less than 10 percent. The dehydrated pork was then extracted to remove the fat and fed to rats as the protein component of a basal ration. The amount of the protein fraction fed was equivalent to 1.6 percent nitrogen. Tests were also conducted with dried whole milk; white, whole-wheat, and rye breads; mixtures of pork and bread; and mixtures of dried whole milk and bread. The average digestive coefficient of all cuts of pork was 98.8; white bread, 93; rye bread, 90.5; whole-wheat bread, 89.3; and dried whole milk, 90.1.

The biological value of the protein of the various pork cuts was lowest in those cuts requiring the longest cooking time (ham and picnic shoulder), and was highest and most uniform in the ground samples.

On a diet in which white, whole-wheat, or rye bread provided the sole source of nitrogen, the biological value of the protein was much lower than when pork alone was the source of nitrogen.

"Pork fed in mixtures with bread had a marked effect in making good the deficiency in lysine and possibly in other amino acids. The biological value of the protein in mixtures containing equal parts of pork and bread nitrogen was equal to that in pork alone. In mixtures of 1 part of pork nitrogen and 2 parts of bread nitrogen, the protein was of somewhat lower biological value than that in pork alone but of much higher value than that in bread alone." The protein in whole-wheat bread and pork mixtures was somewhat superior to that in comparable mixtures containing white or rye bread.

Studies on the comparative nutritive value of fats.—V, The growth rate and efficiency of conversion of various diets to tissue in rats weaned at 14 days, H. J. DEUEL, JR., and E. MOVITT. (Univ. Calif.). (*Jour. Nutr.*, 29 (1945), No. 4, pp. 237–244, illus. 2).—Contrary to the results obtained by Boutwell et al. (*E. S. R.*, 89, p. 758; 92, p. 291), Deuel and his coworkers have confirmed their own previous findings (*E. S. R.*, 92, p. 857), obtained on rats weaned at 21 days. Using the technic applied in their previous studies, but weaning the rats at 14 days instead of 21 days, the same results were obtained. Over a 12-week period, 120 male and 112 female rats exhibited the same rate of growth when fed a basal diet of mineralized skim milk powder to which was added vitamin-fortified fat in the form of corn, peanut, cottonseed, or peanut oil, margarine, or butter. "The efficiency of transformation of these diets to body tissue was also similar within experimental error." The authors conclude that aside from differences in vitamin content, the fats tested "have essentially equal growth-promoting values when fed with lactose as the exclusive carbohydrate in the proportion found in milk."

Cholesterol content of foods. R. OKEY. (Calif. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 6, pp. 341–344).—Tabulated data, composed of original experimental results and compiled material, are presented for the cholesterol content of foods of animal origin and some substances used for foods. These include meats and meat organs (such as brain, liver, lung, kidney, sweetbread, heart, and

tripe), poultry, fish, cheese, eggs, butter, and casein. The total digitonin precipitable sterols in primex and dried brewers' yeast are also estimated. Data are presented on the cholesterol content of the various tissues of the rat as influenced by diets containing 5, 10, and 15 percent fat. The cholesterol content of the tissues of various laboratory animals (cat, dog, rabbit, guinea pig) as well as man is also tabulated.

Results show that egg yolk and brain are the only foods containing more than 1 percent cholesterol. Figures for kidney, sweetbreads, and liver are considerably lower than in previously published tables. "Reasons for discrepancies in cholesterol figures in the literature are briefly given, together with a summary of factors known to affect cholesterol absorption and utilization."

Digestibility of milk as affected by various types of treatment, A. W. TURNER (*Food Res.*, 10 (1945), No. 1, pp. 52-59).—An *in vitro* test for measuring the digestibility of milk is described in detail. It consists essentially in acidifying the milk rapidly to pH 4.7, sampling after 5 and 30 min. digestion at 37° C. with gastric enzymes, adjusting to pH 7.5, adding specially prepared pancreatic-duodenal enzymes, digesting for 15 to 180 min. at this pH with the removal, at regular intervals, of samples which are immediately acidified to pH 4.7, and filtering. The measurement of the acid-insoluble protein fraction converted to acid-soluble protein during the digestion is given. Several types of cow's milk—raw, pasteurized at less than 149° F., and pasteurized at over 189.5°, as well as human, mare, and goat's milk, were tested. The results showed that "pasteurization, homogenization, desiccation, zeolite treatment, and skimming did not appreciably alter the relative digestibility of cow's milk."

"Enzyme-treated and hyper-heated milks digested relatively faster than pasteurized whole cow's milk. The fact that human milk is more satisfactory for infant feeding than cow's milk has been substantiated. Barium sulfate prevented the normal digestion of milk protein and weakened the gel structure of milk curds under the conditions of this investigation."

Mare's milk was digested more readily than cow's milk, while the digestibility of goat's milk was found to be inferior to that of cow's milk (pasteurized whole).

Fluoride domestic waters and systemic effects, I, II (*Pub. Health Rpts. [U. S.]*, 59 (1944), Nos. 48, pp. 1543-1558+, illus. 4; 49, pp. 1575-1591+, illus. 2).

I. *Relation to bone-fracture experience, height, and weight of high school boys and young selectees of the Armed Forces of the United States*, F. J. McClure.—An attempt was made to correlate the fluorine content in drinking water to the bone-fracture experience, height, and weight of high school boys and young adult males. The results indicated that no correlation could be established. The fluorine content of water varied from 0.0 p. p. m. to 6.0 p. p. m. A bibliography of 42 references is included.

II. *Fluorine content of urine in relation to fluorine in drinking water*, F. J. McClure and C. A. Kinser.—An estimate was made of the fluorine content of urine specimens obtained from a large number of men and boys from different parts of the country. Results showed that when the available drinking water was free of fluorine, the fluorine found in urine averaged from 0.3 to 0.5 p. p. m. If the waters contained as little as 0.5 p. p. m. of fluorine, the amount excreted in the urine increased and remained proportional to the fluorine content of the drinking water through the range studied (0.5 to 5.1 p. p. m.). The authors conclude from the excretion studies that water-borne fluorine is an important source of fluorine in human diets. The close correlation between the fluorine in drinking water and that of urine "suggests that the presumed hazard of cumulative toxic bone-fluorosis surrounding certain water-borne sources of fluorine in the United States is greatly reduced by this relationship."

Effect of quantity preparation procedures on vitamin retention and palatability of dehydrated potato shreds, F. FENTON, M. ALBURY, K. VISNYEI, J. F. THOMPSON, and E. GLEIM. (Cornell Univ.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 8, pp. 518-521).—Dehydrated potato shreds were prepared four different ways—the methods of soaking, stirring, and cooking were varied and the data tabulated as to the retention of ascorbic acid, thiamine, riboflavin, and niacin.

Results showed that the dehydrated potatoes contained an average of 76.5 mg. ascorbic acid, 0.323 mg. thiamine, 0.148 mg. riboflavin, and 6.15 mg. niacin per 100 gm. on the dry basis. The range of the vitamins in the prepared mashed potatoes per 100-gm. serving were as follows: Ascorbic acid, 5.01 to 6.85 mg.; thiamine, 0.0673 to 0.0683 mg.; riboflavin, 0.0589 to 0.0738 mg.; niacin, 1.07 to 1.31 mg. One sample of potatoes was prepared as baked, hash-brown after preliminary soaking in cold water. This showed greatest retention of ascorbic acid during rehydration and when held 1½ hr. after cooking. The mashed potatoes all showed great loss in ascorbic acid content when held 1½ to 3 hr. before serving (ascorbic acid content 0.496 to 2.10 mg. per 100 gm.—moist basis).

The authors noted that best results were obtained with mashed potatoes when they were rehydrated in hot water, beaten for a short time (5 min. only), and kept hot during mashing. No loss of thiamine, riboflavin, and niacin occurred in the mashed product, whereas a loss of approximately 15 percent in the thiamine content occurred in the hash-brown potatoes.

The following recommendations were also made—do not mash potatoes until immediately before serving, and hold as short a time as possible after mashing. If potatoes must be held before serving, prepare as baked, hash-brown.

A high-vitamin, high-caloric sweetmeat incorporating dried brewers' yeast, J. R. SPINELLA (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 2, pp. 84-85).—Experiments were made using a high-vitamin dried brewers' yeast in the preparation of a sweetmeat of high nutritive and caloric value. Formulas are given for the preparation of products which contain dried whole milk, butter, cheese, peanut butter, or cocoa as well as sugar, vinegar, and flavoring. The finished product, about the consistency of fudge, was found to be palatable and acceptable when tried out on the laboratory personnel and in hospitals. Each serving (about 40 gm.), provided from 169 to 207 calories, 3.9 to 5.4 gm. protein, 6.9 to 10.4 gm. fat, 1.64 to 1.68 mg. thiamine, and appreciable amounts of other B vitamins and minerals. The use of such a product in hospitals where a high-vitamin, high-caloric diet is recommended; where restricted diets are lacking in vitamins and minerals; and in the relief feeding in devastated countries is discussed.

Vitamin stability in commercially-cooked foods enriched with primary dried yeast, R. C. SUNDERMAN, R. M. KAHN, and H. T. SCHMITT (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 2, pp. 81-83).—Four foods frequently served in industrial cafeterias (creole bean soup, chop suey, veal stew, and macaroni with tomato sauce), were prepared in 100- to 150-gal. quantities in steam-jacketed kettles. A primary dried yeast, known to be a good source of the B-complex vitamins, was added to one portion of each batch—3 oz. of yeast per gallon of cooked food. Assays for thiamine and riboflavin were carried out on samples of the control and yeast-enriched foods immediately after cooking, and after a holding period of approximately 2 hr. at 124° to 180° F. The veal stew and macaroni dishes were also assayed after being held overnight in a refrigerator and reheated on the steam table.

Results showed that the destruction of thiamine and riboflavin was negligible for the first standing period in all foods except veal stew, where 10 percent of the thiamine and 13 percent of the riboflavin were apparently destroyed. After reheating the stew the second time, the thiamine loss was increased to 28 and riboflavin loss to 25 percent. The enriched foods provided from 760 to 1,275 µg. thiamine, and

from 567 to 708 µg. riboflavin per 8-oz. serving, while similar nonenriched samples supplied from 72 to 156 µg. thiamine, and from 74 to 352 µg. riboflavin.

The authors found that the enrichment with yeast provided a potent source of B vitamins as well as other nutritional factors without impairing the palatability or appearance of the food. They considered the use of such yeast to be economically feasible in most school, hospital, and industrial cafeterias.

Losses of ascorbic acid and four B vitamins in vegetables as a result of dehydration, storage, and cooking, A. F. MORGAN, G. MACKINNEY, and R. CAILLEAU. (Univ. Calif. coop. U. S. D. A.). (*Food Res.*, 10 (1945), No. 1, pp. 5-15, illus. 5).—Experiments were carried out on carrots, spinach, broccoli, peas, and snap beans. The vegetables were dehydrated unblanched or after blanching by one of the following procedures: Steam, distilled water, 1 percent salt water, or pressure cooking. Assays were made on raw, blanched, dehydrated, cooked, and stored samples. Results of the cooking and palatability tests have been reported by Stillman et al. (*E. S. R.*, 92, p. 294). Ascorbic acid, thiamine, riboflavin, nicotinic acid, and pantothenic acid results are now presented in tabular form and discussed.

Retention of riboflavin, pantothenic acid, and nicotinic acid during the process of blanching and dehydrating the vegetables was about as high as during the ordinary cooking of fresh vegetables. Losses of ascorbic acid and thiamine were usually greater in unblanched dehydrated vegetables than in blanched, both in the stored and freshly dehydrated samples. Leaching during the blanching process, particularly if a water blanch were used, could cause greater loss of the four B-vitamins than enzyme catalyzed oxidation in the unblanched samples. Only ascorbic acid and thiamine values were appreciably altered when the dehydrated samples were stored.

The vitamin values for the raw carrots, spinach, broccoli, peas, and snap beans, respectively, were as follows: Ascorbic acid 3, 81, 102, 28, 12 mg./100 gm.; thiamine 0.04, 0.14, 0.08, 0.13, 0.13 mg./100 gm.; riboflavin 0.04, 0.28, 0.20, 0.15, 0.13 mg./100 gm.; pantothenic acid 0.16, undetermined, 0.85, 0.12, 0.11 mg./100 gm.; and nicotinic acid 0.24, 0.63, 0.75, 2.15, and 0.54 mg./100 gm. fresh weight.

Ascorbic acid losses due to blanching and dehydration ranged from 70 to 90 percent in snap beans and spinach, respectively, approximately 50 percent in peas and carrots, and 11 to 20 percent in broccoli. Best retention of thiamine occurred in the steam-blanched dehydrated products, ranging from 65 to 80 percent after dehydration. With broccoli, about 40 percent of the remaining thiamine was lost upon storage for 3 mo. at 30° C.

Riboflavin losses in spinach, snap beans, and broccoli ranged from 20 to 35 percent after dehydration and reconstitution, being similar to values found for fresh-cooked samples. Carrots and peas lost little riboflavin during dehydration, but nearly 50 percent of the remaining amount during reconstitution.

Of the original pantothenic acid present, only 40 percent was retained in dehydrated broccoli, and approximately 50 percent in snap beans. The results from the other vegetables were too few and irregular to permit any definite conclusions to be drawn.

Nicotinic acid losses varied from 20 to 50 percent in ordinary cooking and in dehydration plus reconstitution. In blanched samples of dehydrated spinach, broccoli, and peas, no appreciable loss was discernable after 3 months' storage at 30°

Ascorbic acid, thiamin, and riboflavin retention in quick-frozen broccoli in institution food service, J. B. JONES, M. A. WOOD, M. G. PHILLIPS, F. FENTON, and K. W. HARRIS. ([N. Y.] Cornell Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 6, pp. 369-372).—The broccoli was frozen commercially as for the previous study by Barnes et al. (*E. S. R.*, 89, p. 403). Preparations were made as follows: (1) After defrosting at 78°-82° F. for 1½ hr., 5-lb. lots were steamed

8 min. in a two-compartment, direct-connected steamer and sampled immediately; (2) 5-lb. lots of solidly frozen broccoli were steamed under pressure 9 min. in 5 qt. of boiling salted water, an average of 223°, and 3-4 lb. pressure being used; (3) in a 5-gal. deep-type, steam-jacketed kettle, 5-lb. lots of solidly frozen broccoli were immersed in 8 qt. of boiling salted water, boiled uncovered 8 min., and drained 2½ min.; (4) same as (3) but boiled 24 min.; (5) in a 25-gal. shallow-type, steam-jacketed kettle, 20-lb. lots solidly frozen broccoli, in a shallow perforated pan, were immersed in 14 gal. of boiling salted water, and boiled 7 min. and drained as in (3); (6) in a 10-qt. aluminum pan, on a gas range, 5-lb. lots of solidly frozen broccoli in 4 qt. of boiling salted water were cooked 16 min. and drained 2½ min. before sampling; and (7) in a 16-gal. aluminum stockpot on a U. S. Army field range, 20-lb. lots of broccoli, previously defrosted 6 hr. at 78°-82°, were immersed in 6 gal. of boiling salted water and cooked uncovered 16-20 min. and drained 5 min.

Vitamin values in milligrams per 100 gm. determined on buds, stalks, and combined buds and stalks of uncooked quick-frozen broccoli were, respectively, as follows: Ascorbic acid 60, 107, 88; thiamine 0.095, 0.058, 0.077; and riboflavin 0.152, 0.080, and 0.137.

The results of the various methods of cooking showed that "steaming quick-frozen broccoli resulted in the greatest retention, over 80 percent, of the 3 water-soluble vitamins. The steamed product contained per 100 gm.: Ascorbic acid, 84 mg.; thiamine, 0.053 mg.; riboflavin, 0.108 mg. Broccoli cooked in water to cover, either by boiling or steaming, retained approximately 50 to 60 percent of its original ascorbic acid and thiamine, and 50 to 70 percent of the riboflavin with an average content as follows: Ascorbic acid, 53 mg.; thiamine, 0.048 mg.; riboflavin, 0.087 mg. per 100 gm. All the methods used yielded acceptable products; that cooked in water either by boiling or steaming, rated higher, however, in general acceptability than that steamed without water."

Studies on holding the cooked broccoli before serving, and various methods of reheating and holding were carried out with the following results: Holding at 150° for 15, 30, and 120 min. produced losses of ascorbic acid amounting to 0, 13, and 36 percent, respectively. Little loss of thiamine and riboflavin occurred even after 2 hr. Cooked broccoli, covered with cold tap water and held at room temperature 6 hr. and reheated in the water in which it had stood, lost 60 percent ascorbic acid, 52 percent thiamine, and 37 percent riboflavin. When reheated in fresh water, the losses were from 5 to 10 percent greater. Cooked broccoli held 6 hr. in the refrigerator and reheated in hot tap water showed losses of 47 percent ascorbic acid, 39 percent thiamine, and 32 percent riboflavin. Palatability was considerably impaired by these procedures.

Carotene and ascorbic acid in fresh and salted vegetables, S. C. HARRIS. (Cornell Univ.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 6, pp. 360-362).—"There is considerable loss of carotene in vegetables preserved with salt. These losses increase with time of storage. In 6 to 7½ mo., approximately 80 percent of the carotene in dandelions was destroyed, 71 percent in asparagus, 73 percent in spinach, 46 percent in peas, and 90 percent in green beans. Carotene losses in broccoli, endive, and brussels sprouts were 56, 66, and 77 percent, respectively, after 3 mo. The destruction of total ascorbic acid in salted vegetables after 3 mo. storage is of even greater magnitude. In broccoli, endive, and brussels sprouts the losses ranged from 96 to 98 percent. Therefore, from the standpoint of vitamin C content, salted products are of little value."

A bibliography of 25 references is included.

Studies on bone fracture healing.—I, Effect of vitamins A and D, D. H. COPP and M. GREENBERG. (Univ. Calif.). (*Jour. Nutr.*, 29 (1945), No. 4, pp. 261-267).—"A method for studying healing in standard fractures of the rat fibula is described,

in which calcification activity is determined by measuring the uptake of Sr [radioactive isotope] by the callus, and functional recovery by the increase in breaking strength of the fractured bone.

"In normal rats, the most active calcification in the callus occurs over the period from 8 to 16 days. The broken bone attains a strength comparable to that of the normal bone on the opposite side within 12 to 16 days.

"In vitamin A deficient rats, the callus is smaller than in normal animals, and the calcification is less active. In those treated with large doses of the vitamin the increase in strength of the fractured bone was comparable to that in normal rats. On the other hand the untreated animals showed a significant delay in fracture healing. This may have been due to the debilitated condition of the latter.

"In rachitic animals, there is no significant calcification of the callus, unless vitamin D is added to the diet.

"In animals receiving toxic doses of vitamin D, the callus is small, calcification activity is reduced, and recovery in strength is delayed."

Constituents of the crude carotene of certain human foods, A. R. KEMMERER, G. S. FRAPS, and W. W. MEINKE. (Tex. Expt. Sta.). (*Food Res.*, 10 (1945), No. 1, pp. 66-71).—The chromatographic adsorption method of Kemmerer and Fraps (*E. S. R.*, 91, p. 243) was applied to a wide variety of vegetables in determining the following carotene fractions: Impurity A (which includes lycopene), neo- β -carotene U, β -carotene, neo- β -carotene B, and α -carotene. The total crude carotene was determined, and the β -carotene equivalent of the fractions was calculated from their known carotene activity.

Green leafy vegetables averaged 76 percent β -carotene, and 6, 8, and 10 percent of impurity A, and neo- β -carotenes B and U, respectively. Raw sweetpotato averaged 86 percent β -carotene, 10 percent impurity A, and 4 percent neo- β -carotene. Squash and pumpkin contained α -carotene in amounts ranging from 4 to 28 percent, probably due to varietal differences. Beta-carotene averaged 51 percent. Raw carrots averaged 29 percent α -, 62 percent β -carotene, and 5 percent or less of the other carotenes. Canned apricots were also tested and averaged 62 percent β -carotene, 30 percent impurity A, and small amounts of neo- β -carotenes B and U. Cooking foods generally decreased the percentage of β -carotene and increased the percentage of α -carotene. Dehydration had no appreciable effect on the constituents of the crude carotene.

The average β -carotene equivalent of the foods studied (in terms of percentage of total crude carotene present), ranged as follows: "Raw sweetpotatoes 88, raw leafy vegetables 80, dehydrated and raw carrots 78, dehydrated and cooked sweetpotatoes 76, dehydrated leafy vegetables 74, cooked leafy vegetables 73, cooked carrots 72, canned apricots 65, canned leafy vegetables 56, raw squash and pumpkin 54.7, canned pumpkin 47, and cooked squash and pumpkin 40."

Carotenoid content of carrot varieties and strains, R. H. HARPER and F. P. ZSCHEILE. (Ind. Expt. Sta.). (*Food Res.*, 10 (1945), No. 1, pp. 84-97, illus. 2)—The carotenoid system of carrots was studied spectroscopically by the method of Zscheile et al. (*E. S. R.*, 88, p. 292) and chromatographically. Zeta-carotene, gamma carotene, and lycopene, as well as alpha- and beta-carotenes were estimated in 16 commercial varieties and 18 imported strains of carrots. The authors note that "zeta-carotene appears to occur in considerable quantities rather generally in carrots, and lycopene was identified in numerous varieties. The content of cis-isomers of alpha- and beta-carotenes is very low in fresh carrots. Heat applied during analytical procedures may cause error owing to isomerization.

"Garden varieties average 54 μ g per gram total carotenes, varying over a range of about twofold. The percentage of alpha-carotene in these strains averaged 46 percent, making it very significant in the estimation of provitamin A contents."

Studies on carotenoid metabolism.—V, The effect of a high vitamin A intake on the composition of human milk. M. C. HRUBETZ, H. J. DEVEL, JR., and B. J. HANLEY. (Univ. Calif.). (*Jour. Nutr.*, 29 (1945), No. 4, pp. 245-254).—Daily vitamin A supplements of 50,000, 100,000, and 200,000 International Units were fed to groups of women in their sixth month of pregnancy, and continued until lactation was voluntarily terminated. Comparisons were made with a nonsupplemented group of women. The tabulated results show that the unsupplemented controls, during the post-partum period up to 60 days, gave vitamin A values (vitamin A plus carotene) ranging from 234 to 424 I.U. per 100 cc. milk; while the supplemented group gave substantially higher values for the same period—747, 1,037, 1,177 I.U. per 100 cc. milk for the three levels of vitamin A fed. During the later periods of the test, only in the 100,000, and 200,000 I.U. supplemented groups were the high vitamin A values retained in the milk.

"No changes were noted in protein, fat, or ash content or total solids by supplementation with vitamin A. Protein and ash decreased progressively and fat increased as the lactation cycle proceeded.

"No depression in carotene excretion similar to that previously noted in cows [E. S. R., 87, p. 884] and in chickens [E. S. R., 92, p. 104] concomitantly with the administration of large doses of vitamin A was noted in the present tests."

The authors conclude "there is no evidence of a deleterious effect caused by the continued administration of the large dosages of vitamin A, employed in the present tests, to women during the last trimester of pregnancy and during the lactation period. On the other hand, these data should not be interpreted to mean that the feeding of large doses of vitamin A to pregnant and lactating women is either necessary or desirable."

B vitamins in the tissues of rats maintained at high and low temperatures. R. J. WILLIAMS, M. A. EPPRIGHT, E. CUNNINGHAM, and C. A. MILLS (*Arch. Biochem.*, 5 (1944), No. 3, pp. 299-306).—Rats fed a commercial food mixture or a synthetic diet supplemented with the necessary vitamins were maintained at 68° and 90° F. for 3 weeks or more before being killed. The five tissues studied (brain, heart, kidney, liver, and muscle) were packed and stored in dry ice until examined. Riboflavin, niacin, pantothenic acid, folic acid, pyridoxine, biotin, and inositol were determined by methods previously developed.* Thiamine was determined by both the yeast-growth method of Eppright and Williams noted on page 579 and the method of Niven and Smiley (E. S. R., 90, p. 442), using *Streptococcus salivarius*; and p-amino-benzoic acid was determined by the method of Lewis (E. S. R., 89, p. 412).

The stored tissues of the rats fed the food mixture showed unexpectedly low biotin values, which could not be duplicated when relatively fresh tissues were used. The only cases in which a consistent difference between the tissue of the low-temperature and high-temperature animals occurred were in the thiamine assays made by the yeast-growth method. If the thiamine values as determined by *S. salivarius* are reliable, then the unknown yeast-growth stimulant appeared to be largely absent from the low-temperature animals kept on the synthetic diet, because the yeast-growth method gave values in four tissues, excluding muscle, in good agreement with those obtained by the *S. salivarius* method. Judging from the number of rats used (12) and the experimental conditions employed, no significant differences in the vitamin B content between rats in cold and warm environment have been demonstrated.

Microbiological activity of synthetic biotin, its optical isomers, and related compounds. J. L. STOKES and M. GUNNESS (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 121-126).—Comparison of the growth-promoting properties of synthetic biotin with natural biotin, using five representative microorganisms (*Lactobacillus casei*,

* Tex. Univ. Pub. 4137 (1941). pp. 11-30, 36-37, illus. 3.

L. arabinosus, *Saccharomyces cerevisiae*, *Rhizobium trifolii*, and *Neurospora sitophila*), indicates that the two substances are identical.

"The synthetic vitamin, like the natural product, forms an inactive heat-dissociable complex with avidin. *l*-Biotin and *dl*-allobiotin support microbial growth only when used in very large amounts; their slight activities are considered to be due, probably, to contamination with biotin or *dl*-biotin.

"Synthetic *dl*-diamino acid sulfate is 4 to 7 percent as active as biotin for lactobacilli.

"Desthiobiotin can substitute for biotin in the nutrition of a number of yeasts and a fungus but does not support growth of the three bacteria tested. For one yeast strain, a period of adaptation to desthiobiotin is necessary before rapid growth can occur. Growth with desthiobiotin is accompanied by the formation of a substance having the properties of biotin."

Availability of vitamins in foods and food products.—II, Riboflavin balances in dried liver, in a liver vitamin concentrate, and in brewers' and bakers' yeast, B. SURE. (Ark. Expt. Sta.) (*Jour. Nutr.*, 29 (1945), No. 4, pp. 283-288).—This is a continuation of the author's previous study (E. S. R., 92, p. 595).

"Albino rats fed dried liver and a dried vitamin concentrate prepared from liver as sources of riboflavin excreted much greater proportions of the total intake of this vitamin in the feces and urine than animals which were given equivalent amounts of this vitamin. Since the greater part of the riboflavin in these liver products exists in the free state, the large excretions of this vitamin in the feces could not be due to poor absorption; in all probability they were due to bacterial synthesis. In the yeasts about 50 percent of the riboflavin was present in the free form; therefore, the large fecal excretions of riboflavin of the animals which received the yeasts may have been of dietary or of bacterial origin.

"The animals on the dried liver and on the higher intake of liver vitamin concentrate excreted larger amounts of riboflavin in the urine than the animals given the same amounts of the pure vitamin. The reason for this is not at all clear, since we have no definite information on absorption because of the complication of bacterial synthesis."

Thiamine content of Japanese soybean products, C. D. MILLER. (Hawaii Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 7, pp. 430-432).—The various products tested for thiamine were: Raw soaked soybeans, cooked soybeans (1 hr. at 15-lb. pressure), soybean milk (tonyu), soybean curd residue (kirazu), soybean curd (tofu), water drained from tofu, fried soybean curd (aburage), and a mixture of fermented rice and soybeans (miso). Most of these products were prepared commercially, but only tofu, aburage, and miso are consumed by a considerable portion of the Japanese and other oriental peoples in Hawaii.

Assays were made by the author's rat-growth method (E. S. R., 90, p. 855). Results showed that although soybeans contained 835 µg. of thiamine per 100 gm. of raw soybean on a dry weight basis, a loss of about 75 percent occurs when the soybeans are cooked 1 hr. at 15-lb. pressure.

In the preparation of the various soybean curd products even greater losses of thiamine take place. Tofu was found to contain only 54 µg. per 100 gm. The author concludes that "although making soybeans into soybean curd (tofu) produces a product of low-fiber content and a good source of low-cost, good quality, highly digestible protein, the tofu retains less than 20 percent of the original thiamine of the soybeans from which it is made. About 7 percent of the thiamine appears to be destroyed by the cooking process, and about 20 percent remains in the residue (kirazu) from which the soybean 'milk' is squeezed. The remainder of the thiamine (almost 60 percent) is lost in the discarded liquid which drains off when the protein is precipitated and pressed.

"Aburage (a fried soybean curd) loses additional thiamine as a result of the cooking process.

"Miso (fermented rice and soybeans) contains more thiamine than tofu, but since relatively small amounts are used even by people who favor this food, its contribution to the daily thiamine need is not great."

Thiamin content of cereals before and after treatment with carbon disulfide and methyl bromide to destroy insects, C. D. MILLER. (Hawaii Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 8, pp. 516-517).—Brown rice, whole-wheat flour, and rolled oats were tested for thiamine by the rat-growth method of the author (E. S. R., 90, p. 855). Samples treated with carbon disulfide or methyl bromide were compared with similar untreated material. Results showed that there was no statistically significant difference in the thiamine contents of the treated v. the untreated samples.

Thiamine retention and composition of U. S. Army bread, R. B. MECKEL and G. ANDERSON (*Cereal Chem.*, 22 (1945), No. 5, pp. 429-437).—Army breads, made with enriched flour and described as garrison 1¼-lb. loaf or 10-lb. sheet, and field 10-lb. sheet or 4-lb. round, were prepared as indicated in the War Department Technical Manual No. 10-410. The dough formulas are listed, and in general contain relatively low amounts of sugar (1-3 percent) and shortening (1-5 percent). No yeast foods or bread improvers were used. Baking time varied from 35 min. at 440° F. for the garrison-type bread to 80 min. at 475°-360° for the 4-lb. field round. Proximate composition, iron, calcium, phosphorus, thiamine, niacin, and riboflavin values have been determined. The 4-lb. field loaf designed to resist relatively long periods of storage (16 days) was assayed at intervals from 1 to 14 days after baking and showed no loss of vitamins due to storage.

Loss of thiamine ranged from 14-24 percent depending upon the nature of the loaf and the cooking temperatures employed. Inclusion of nonfat dry milk solids (2-6 percent) increased the protein, calcium, phosphorus, and riboflavin content. Under all conditions encountered Army bread more than equaled the minimum standards required for enriched bread.

Some factors influencing the fecal elimination of thiamine by human subjects, A. WILLIAMSON and H. T. PARSONS. (Wis. Expt. Sta.). (*Jour. Nutr.*, 29 (1945), No. 1, pp. 51-59, illus. 2).—Experiments were carried out on 12 normal women who subsisted on a low fiber basal diet of milk, eggs, ice cream, cheese, white unenriched bread, and butter, which supplied about 0.6 mg. thiamine. Over a 7-day period supplements of drained crushed pineapple or an equivalent amount of the juice were added to the basal diet, giving a daily thiamine intake of 1.3 mg. Later experiments with a meat basal diet used cured hams to replace the milk, eggs, and cheese (thiamine = 3.2 mg. per day) for 5-day periods. The results showed that the increased fiber content caused by the substitution of crushed pineapple for pineapple juice in the diet had a marked effect upon the thiamine content of the feces, causing a significantly greater output. There was no definite variation in urinary thiamine excretion in relation to the individual fiber content of the diet or sequence of periods. Whether on a milk or meat basal diet the fecal thiamine excretion remained relatively constant, although the thiamine intake level was more than twice as high on the meat diet. The authors concluded that the ingestion of large amounts of plant fiber (pineapple) tended to be associated with relatively large fecal thiamine eliminations. Interference with absorption was not indicated so much as stimulation of intestinal synthesis of thiamine.

Ascorbic acid content of food served to army students, M. M. KRAMER. (Kans. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 6, pp. 348-350).—Food served to army students for a two-week period in 1944 was secured in duplicate or triplicate from servers at different stations on the four-way counter, and was

assayed for ascorbic acid content. "Determinations showed that the army students received an average of 829 mg. ascorbic acid per day, with a minimum of 34.1 and a maximum of 131.3 mg." The suggested requirement of 75 mg. per day (made by the National Research Council) was thus met with a 10 percent margin. "Citrus supplied about half the ascorbic acid in the diet, tomatoes more than one tenth, and vegetables other than potatoes about one fourth of the total. . . . Citrus fruits, oranges and grapefruit at the time were a cheap source of ascorbic acid, supplying it at about 5 ct. per 100 mg. Canned grapefruit juice was a little more expensive source, about 7ct. for the same amount. Tomato juice, canned, was more than 10 ct.; while 100 mg. ascorbic acid, obtained from the fresh tomatoes then available, cost more than 20 ct.

Ascorbic acid content of fruits of Puerto Rico, with data on miscellaneous products, H. E. MUNSELL (*Food Res*, 10 (1945), No. 1, pp. 42-51).—The reduced ascorbic acid content has been estimated for 31 fruits, 4 vegetables, and miscellaneous products such as coconut water, tropical almond, sugar cane juice, and various types of guava paste and jelly. The results are tabulated and the foods listed under their local names, English common names, and botanical names. The origin of the food studied is given, most fruit being bought on the open market.

Fruits classified as good sources of ascorbic acid are listed as follows: Guavas 149.1 to 441.7 mg./100 gm. whole fruit; orange (juice) 56.9 mg/100 cc.; grapefruit (juice) 45.1 mg.; lime and lemon (juice) 32.3; ripe papaya 75 to 108.6 mg./100 gm.

Locally used fruits, less well known in the temperate climates but having a relatively high ascorbic acid content, were: Custard apple 34.5 mg.; soursop 25.7 mg.; golden apple 50.1 mg.; sapodilla 20.2 mg.; and sapote 46.8 mg./100 gm. of fruit.

Guava paste also proved to be a good source of ascorbic acid. Two commercial products sampled gave values of 24 to 28 mg/100 gm., while several home-made samples ranged from 69.6 to 110.6 mg./100 gm.

Vitamin C content of processing residue from Florida citrus fruits, C. D. ATKINS, E. WIEDERHOLD, and E. L. MOORE. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 9, pp. 260-262, 281).—In this investigation, four varieties of Florida oranges and two varieties of grapefruit were analyzed to determine the distribution of vitamin C in various parts of the fruit and the retention of vitamin C in the peel and rag residues remaining after juice extraction. The flavedo in all varieties examined contained a higher concentration of vitamin C than any other part of the fruit, accounting for 34 percent of the total vitamin C in the oranges; the albedo contained 19 percent; pressing residue 21 percent; and expressed juice 26 percent. In the grapefruit, determinations showed the flavedo to contain 31 percent of all vitamin C present in the fruit; the albedo 33 percent; pressing residue 19 percent; and the expressed juice 17 percent. Vitamin C retention in the fruit residue of oranges was 74 percent and in grapefruit residue 83 percent, which may be regarded as a potential source of vitamin C.

Effect of various home practices on ascorbic acid content of potatoes, F. O. VAN DUYN, J. T. CHASE, and J. I. SIMPSON. (Univ. Ill.). (*Food Res*, 10 (1945), No. 1, pp. 72-83).—The work was undertaken as part of the National Cooperative Experiment Station Project on Conservation of Nutritive Values of Foods.

Mean values for the ascorbic acid content of four varieties of peeled potatoes were found as follows: Chippewa, 0.088 mg./gm.; Idaho, 0.106; Irish Cobbler, 0.209; and Red Triumph 0.076 mg./gm. Only the Irish Cobbler variety was experimentally grown and analyzed within a month after digging, the other varieties having been purchased on the open market and stored approximately 4-6 mo.

In 2 varieties studied, no significant changes in ascorbic acid occurred when the peeled potatoes, either whole or quartered, were allowed to stand in tap water for 1-3 hr. Potatoes baked to an internal temperature of 96° C. retained 87-88 per-

cent of their ascorbic acid with the exception of the Red Triumph variety, which only retained 78 percent.

In boiling, steaming, pressure cooking, and holding tests, carried out with the Chippewa variety only, no loss of ascorbic acid occurred when the potatoes were boiled and then skinned. Peeled potatoes when boiled, steamed, or cooked in a pressure saucepan retained 87, 86, and 85 percent ascorbic acid, respectively. Holding the peeled-boiled potatoes in the refrigerator 24 and 70 hr. produced additional losses of ascorbic acid of 40 and 69 percent respectively.

Twenty-nine references are listed.

The vitamin-C content of raw and cooked vegetables, [I], L. H. LAMPITT, L. C. BAKER, and T. L. PARKINSON (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 62 (1943), No. 5, pp. 61-67, illus. 5).—A detailed description is given of the methods used in preparing, sampling, cooking, and assaying 35 different kinds of vegetables which were purchased in the open market. Total vitamin C determinations were made by a modification of the Harris and Olliver method (E. S. R., 89, p. 625). Data on the following vegetables have been included: Artichoke (Jerusalem), celeriac, chives, colewort, endive, horseradish, kohlrabi, leeks, marrow, mint, swedes, and watercress. Studies on the distribution of vitamin C in the outer and inner leaves of cabbage and lettuce as well as in various parts of other leafy vegetables have been tabulated. Detailed experiments on 92 samples of raw cabbage indicated that a decided seasonal variation in vitamin C content occurred with the values rising sharply in the late spring.

Tabulated results are given on the retention of vitamin C after cooking by steaming or boiling in various volumes of water. Graphs are presented illustrating further losses of vitamin C caused by holding (140°–160° F. for several hours) of the following cooked vegetables: Cabbage, brussels sprouts, potatoes, and turnips.

Vitamin-C content of vegetables, II-V, L. H. LAMPITT, L. C. BAKER, and T. L. PARKINSON (*Jour. Soc. Chem. Indus., Trans. and Commun.*, 64 (1945), Nos. 7, pp. 200-202; pp. 202-203, illus. 1; 9, pp. 260-262; pp. 262-264, illus. 3).

II. Effect of storage on raw vegetables.—Following the procedures elaborated in their earlier report (see above), the authors have studied the effect of storage on a limited number of samples of freshly harvested lettuce, broccoli, cabbage, spinach, peas, and broad beans (shelled). The original fresh weight of the vegetables was used as a basis of comparison. Duplicate assays by Mapson's "Formal" method (E. S. R., 93, p. 538) indicated that no substances were formed during storage which might interfere with the ascorbic acid determinations.

Tests were made over a period of 2 to 4 days. Tabulated data show that whole cabbages (10 samples) stored 4 days in a "fairly cool room" retain their initial ascorbic acid values. More limited experiments at 20° C. indicated that vitamin C is lost at different rates by the following vegetables: Lettuce and cabbage (quartered) lose vitamin C rapidly, while broccoli (quartered) and spinach showed no loss of vitamin C after 4 and 2 days' storage, respectively. The authors also note that "storage at 3° reduces the rate of loss, in fact at this temperature an increase in vitamin C content was observed in lettuce, broccoli, and cabbage during the first 2 days of storage.

"There appears to be some correlation between the loss of vitamin C on storage and the general deterioration in appearance, that is, withering of the vegetable."

III. Average figures for raw vegetables—The material presented covers essentially the same foods studied in the authors' previous report (see above). The number of assays has been increased, but the results are in good accord with the preliminary values found. "A table summarizing 850 results for the concentration of vitamin C in raw vegetables is given: An indication of the reliance to be placed on the average figure for any vegetable is obtained by consideration of the number of samples

analyzed, while the degree to which an individual plant may differ from the average is shown by the range of results."

IV. *Effect of cooking on cabbage.*—Cabbages were shredded or quartered and cooked in fast boiling water. When the ratio of water to cabbage was 2 : 1, the retention of vitamin C in shredded cabbage averaged 49 percent, while when a ratio of 6 : 1 was used, the retention dropped to 22 percent. With quartered cabbage, the effect of increasing the ratio of water to cabbage was less marked. Retention of vitamin C was 45 percent at a ratio of 2 : 1, 38 percent at a 6 : 1 ratio, and 34 percent at a 11 : 1 ratio.

The authors concluded that, "in the case of shredded cabbage at a ratio water to cabbage of 2 : 1, during cooking the ascorbic acid diffuses readily from the cabbage tissue with the result that the concentrations of vitamin C in the cooked cabbage and in the liquor are approximately equal. This does not occur in the cooking of quartered cabbage." Cooking experiments, to be reliable, should comprise at least 10 series of tests, particularly when the domestic method of cooking is being investigated.

V. *The influence of variety.*—Experiments were carried out on 10 varieties of cabbage, 3 of lettuce and peas, 2 of runner beans, spinach, beetroots, brussels sprouts, and leeks, and single varieties of broccoli and cauliflower.

"Significant differences in vitamin C concentration were found between different varieties of cabbage, peas, and lettuce grown on the same farm; no significant difference was found between two varieties of runner beans. The concentrations of vitamin C in varieties maturing in the spring and early summer were higher than those in varieties of the same vegetable maturing later in the season. For three varieties of peas and two varieties of lettuce it was found that the concentration of vitamin C in any one variety was significantly higher in 1943 than in 1944. For mature lettuce, cabbage, and brussels sprouts, no correlation was found between weight and concentration of vitamin C."

Studies in mineral metabolism with the aid of artificial radioactive isotopes.—VIII. *Tracer experiments with radioactive calcium and strontium on the mechanism of vitamin D action in rachitic rats.* D. M. GREENBERG (*Jour. Biol. Chem.*, 157 (1945), No. 1, pp. 99–104).—In continuation of these studies (E. S. R., 90, p. 853), experiments were made on rachitic rats with radioactive calcium (Ca^{45}) and strontium (Sr^{90}), following the technics previously used by Cohn and Greenberg (E. S. R., 84, p. 137). Oral and intraperitoneal administration of Ca^{45} and Sr^{90} was given with or without added vitamin D, and the percentage of radioactive isotopes Ca^{45} and Sr^{90} present in the urine, feces, skeleton, teeth, and residual carcass was determined.

In all cases, in the presence of vitamin D, the results showed that a larger proportion of Ca^{45} and Sr^{90} was retained in the bone. When orally administered, less of the radioactive isotopes were unabsorbed, and when injected, less were excreted particularly in the urine.

The author adduces from the tabulated results that vitamin D has a direct action on the mineralization of bone in rachitic animals, besides promoting healing indirectly by increasing the absorption of calcium from the digestive tract.

Vitamin D and pro-vitamin D content of the avocado, S. LASSEN, K. BACON, and J. SUTHERLAND (*Food Res.*, 10 (1945), No. 1, pp. 1–4, illus. 1).—The vitamin D and provitamin D content of avocado oil (obtained from the Fuerte variety of avocado) has been investigated by various methods and found to be negligible.

TEXTILES AND CLOTHING

Developments in textiles in 1944, M. HARRIS and G. B. FRANKENBERG (*Chem. and Engin. News*, 23 (1945), No. 2, pp. 147-149, illus. 1; also in *Rayon Textile Mo.*, 26 (1945), No. 2, pp. 59-61).—In many cases, the inadequacies of fabrics were overcome by the development of a variety of new chemical finishes. New durable water-repellent finishes are obtained by treating fabrics with a suitable resin or with a compound which reacts with the hydroxyl groups of cellulose. The nondurable finishes are made by applying aluminum salts and waxes. Studies indicate that several types of tests are necessary to evaluate properly the usefulness of a fabric for water-repellency. The impact penetration test is one which simulates actual rainfall; the spray, immersion, hydrostatic pressure, and air permeability tests also yield valuable information in relation to water-repellant fabrics. Many compounds and treatments are suggested for fabrics which are vulnerable to fungus deterioration, but none have proved particularly successful. Shrink-resistant treatments are effected by variations of halogenation, resin, alkali, and enzymatic processes. Despite the war, some interesting fundamental developments in new synthetic fibers appeared during 1944. These are listed with a review of their origin and quality. Studies of the contact between skin and fabric, made to measure the relative heat and cold insulation properties, indicate that air layers formed when wool material is worn are important in preventing the evaporation of perspiration and in reducing heat loss from the body. Thin clothing forms a minimum of air layers and promotes evaporative cooling. The authors point out that future investigations will be directed toward a better understanding of the functional properties of fibers and fabrics.

Copper soaps as rot-proofing agents on fabrics, P. B. MARSH, G. A. GREATHOUSE, K. BOLLENBACHER, and M. L. BUTLER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 2, pp. 176-181, illus. 2).—Copper naphthenate was shown to prevent rotting of cotton fabric in soils at a concentration on the fabric lower than those at which copper oleate, copper "tallate," or copper hydrogenated-resinate were similarly protective. The high preservative capacity of copper naphthenate for cotton in contact with soil was shown by several testing methods to be due in part to the fact that naphthenic acid itself is a potent fungicide. Various factors affecting the behavior of cupriferous preservatives in contact with soils are dealt, these including solubilization by hydrolysis, and by complex formation, and deactivation by chemical combination. Data from pure culture test procedures are contrasted with the results obtained by exposure to soils.

HOME MANAGEMENT AND EQUIPMENT

1946 Outlook charts: Farm family living (U. S. Dept. Agr., Bur. Human Nutr. and Home Econ., 1945, pp. 21+, illus. 19).—Facts regarding wartime changes in income, prices, food, clothing, and housing are presented here in chart form. The statistical information was obtained from sample studies of income and expenditures made by the Bureau of Human Nutrition and Home Economics, from the Bureau of Agriculture Economics, and from publications of other agencies.

Saving and spending patterns of the same rural families over a 10-year period, 1933-1942, R. C. FREEMAN, and L. BANE. (Univ. Ill.). (*Amer. Econ. Rev.*, 34 (1944), No. 2, pp. 344-350, illus. 4).—This research project analyzes account books kept by 49 farm families during a continuous 10-yr. period. The disposable income per family averaged \$1,037 in 1933 and \$4,390 in 1942; two-thirds of these families were in the \$1,500 to \$2,499 income level, with the remaining one-third about equally divided above and below that level. The average amount of money spent for living by these families varied from \$758 in 1933 to \$1,891 in 1942. All families had a savings program which increased from 27 percent in 1933 to 57 percent in 1942 with

war bond purchases composing the major part of the savings. In 1933 only one-half of the families owned or partially owned the farms which they operated; 10 yr. later 71 percent were owners, this accounting for the greatest increase in spending during the years 1937-40. In 1933 only one-third of the houses in which these families lived were modernly equipped with electricity, furnace, running water, and bathroom facilities; by 1942 two-thirds of all houses in the group were so equipped. Medical care, recreation, and educational spendings gradually increased during this period. Clothing, food, and operating expenses increased only moderately above price changes. These families apparently increased their saving for the future and decreased their purchases of goods and services.

A survey of some fatigue problems of rural homemakers, with special emphasis on laundering facilities and practices, N. L. PERKINS, W. BEYER, and L. BANE (*Illinois Sta. Bul. 514 (1945), pp. 79, several illus.*).—This bulletin sets forth the detailed findings of a survey in which more than 900 homemakers cooperated, 512 having replied to mailed questionnaires and 411 having participated in home interviews. Contacts were made in 7 representative counties and were limited to members of the Home Bureau and to families supervised by the U. S. D. A. Farm Security Administration. Answers to the questionnaires revealed that there were at least six major homemaking problems contributing to the worry, anxiety, and fatigue of the homemaker, these being problems due to lack of conveniences, problems in family relationships, planning problems, farming problems, health problems, and the problems of accomplishing the heavy load of farm work without help for the homemaker.

Since many of the rural women found the household laundry to be their most fatiguing task, it was subjected to detailed study. Size and composition of the families, size and types of washings, storing and sorting facilities, washing and drying facilities, interruptions, management laundry practices, and attitudes toward laundering were observed during home interviews. The natural fatigue of washing was seen to be greatly increased by lack of suitable equipment and also by inefficient management. Stooping, stretching, lifting, and carrying, the muscular movements particularly responsible for the fatigue in washing, were particularly pronounced when equipment heights were not adjusted to the worker's needs, when filling and emptying facilities were inadequate, and when the source of water supply and the drying lines were at a distance from the washroom. Practical suggestions involving inexpensive, easily constructed or installed equipment or facilities are offered as a means of reducing the carrying of water and clothes, the lifting of water, the stooping to sort and starch clothes, and the stooping and stretching to hang them. Suitable equipment and compact arrangement appeared to be necessary to reduce the number of movements in washing.

Survey discloses what women want in cabinets, N. K. MASTERMAN. (Cornell Univ.). (*Quick Frozen Foods, 7 (1945), No. 11, pp. 83-86, illus. 5.*)—Information presented here is based on a survey similar to that noted previously (E. S. R., 94, p. 537). Data obtained from questionnaires from rural and urban families of Ithaca, N. Y., and its environs provide information on improvements the consumer would like to see in future home freezing and storage units.

REPORTS AND PROCEEDINGS

Shaping the future of Hawaii's agriculture: Report of the University of Hawaii Agricultural Experiment Station for the biennium ending June 1944, J. H. BEAUMONT ET AL. (*Hawaii Sta. Bien. Rpt. 1943-44, pp. 115, illus. 26.*)—In addition to two items noted elsewhere in this issue, this report deals with progress in soil and plant investigations, including tomato breeding and resistance to spotted wilt,

gray leaf spot, and nematodes; breeding pole green beans for rust resistance; variety tests, seed size and treatment, and blight control of potatoes; blight control of celery; varieties of sweetpotatoes, pak choy (white mustard), pepper, lettuce, edible soybeans, and eggplant; nematode control with D-D mixture and chloropicrin for carrots, tomatoes, and lettuce; breeding and culture of papayas; varieties, asexual propagation, and quick freezing of litchi; varieties of avocado, macadamia nuts, and coffee; orchid culture; plant physiology, including the crop-log for use in sugarcane production, germination of Hawaiian range grasses, and sunlight intensity and growth of coffee; agronomy, including variety and cultural tests with Napier grass, culture of koa haole and pigeonpeas, varieties of corn and Sudan grass, pasture fertilization, grazing tests, legumes, and ecology; soils and agricultural chemistry, including minor elements in coffee culture, release of soil K, soil colloids and moisture, and utilization of koa haole and its toxicity for some animals; entomology, including tests of DDT, pests of tomatoes and miscellaneous insects, nonlime dusts for use with cryolite, control of sweetpotato leaf miner, beet webworm, cabbage webworm, greenhouse white fly, Chinese rose-beetle on green beans, and melon fly, and protection of skins from beetle infestations; nutrition, including studies of the thiamine content of pork from garbage- and grain-fed hogs, soybeans and soya products, and rice, the ascorbic acid content of guava products, mangoes, tomatoes, potatoes, and papayas, and the vitamin D content of milk and eggs; dairy experiments, including urea in rations for milking cows, koa haole roughage and pigeonpea forage as a protein substitute, and koa haole as roughage for dairy heifers, pineapple tops and green Napier grass as roughage, sweetpotato meal, raw sweetpotatoes, and pineapple bran for livestock, processed garbage as a protein feed for dairy cows, value of added fat in dairy rations, and silage feeding of Napier grass, koa haole, baker's yeast, strip cane, and pineapple tops and pulp; swine experiments, including cane molasses for weanling pigs, garbage feeding, and koa haole and panicum grass as roughage for brood sows; poultry, including processed garbage, pigeonpea meal, and algaroba bean meal for laying hens, processed garbage and cane molasses for growing chicks, processed v. raw garbage for growing ducks, and tests of turkey production in Hawaii; and parasitology, including studies of the cecal work *Subulura brumpti* of chickens, leptospiral infections, and value of crude naphthalene for controlling the beetle *Alphitobius diaperinus* under poultry houses.

Science for the farmer: Fifty-eighth Annual Report of the Pennsylvania Agricultural Experiment Station [1945], [F. F. LININGER] (*Pennsylvania Sta. Bul.* 475 (1945), pp. 48, illus. 11).—This report notes progress in studies in agricultural engineering, including precautions necessary in the barn curing of hay, a two-torque differential as a preventive of tractor side slip, and an inexpensive mole ditcher; apiculture, including clover seed set improvement and hive packing and packages; dairy production, including timothy plus hominy feed as silage, pasture improvement, parturition milking as an aid in mastitis control, and other mastitis studies; dairy manufacturing, including the addition of ascorbic acid to evaporated milk, quality of frozen milk, palatability of low-lecithin milk on storage, sediment in homogenized milk, and CMC (sodium carboxymethyl cellulose) as a stabilizer in ice cream, sherbets, and ices; farm crops and soil fertility, including corn hybrids for northern Pennsylvania, tests of varieties of wheat, oats, barley, blight-immune potatoes, and late soybeans, baling weedy wheat straw, need of plowing for corn, type of clay and soil fertility, and value of hen manure and a mixture of horse and steer manures; peeling of thick and thin barked oak; livestock, including protein for pigs from ladino clover pasture and value of mixed protein sources, and value of sulfathiazole for calf pneumonia and sulfathaladine for calf scours; nutrition, including seasonal variation of vitamin A content of butter; thiamine content of pork, and need of fats for most efficient use of food; orcharding, including potash deficiency of peaches,

cause of fire blight, spraying machinery improvement, control of codling moth with pheno-lead arsenate sprays, apple rust with fermate-sulfur, cherry fruit fly with lead arsenate mixtures, peach borer with superphosphate ethylene dichloride, plum curculio with DCHNOP oil, leafhoppers and mulching as an aid to plum curculio control, and value of Ni and Cd in fungicides; poultry husbandry, including heritability of resistances to lymphomatosis, prevention of "pasting up" of baby chicks by feeding chick-size grain, green feed substitutes for mash and use of choline in turkey rations, and a new quail ration; rural income and rural welfare, including trend of real estate values, seasonal peaks and valleys in milk production, and farmer patronage of cooperatives; discovery of the brown-banded cockroach in State College; and vegetable and flower growing, including variety tests with tomatoes, inbred sweet corn, lettuce, peppers, and roses, fertilizer studies with tomatoes and peas, spacing of vegetables as affected by fertilizers, compost in mushroom culture, and control of mushroom flies with DDT and Z39, symphylids in greenhouse beds, and maggots in radish with pyridene derivatives.

Agricultural research in South Dakota: Fifty-eighth annual report [of South Dakota Station, 1945], I. B. JOHNSON ET AL. (Partly coop. U. S. D. A.). (*South Dakota Sta. Rpt. 1945, pp. 47+, illus. 9*).—This report notes progress in research in soils and crops, including studies of soil fertility as related to fertilizers, stubble mulch, crop residues, contours, water spreading, and use of crested wheatgrass; breeding wheat, oats, barley, corn, sorghum, Ree wheatgrass, Kochia, soybeans, and potatoes (for scab susceptibility); seed treatment for milo; culture of crested wheatgrass; root rot of biennial *Hyoscyamus*; nutritive value of windrowed hay; livestock production, including value of sweetclover silage for fattening calves, lambing off corn and sorghum, wintering ewes on sorghum fodder, fattening bees, hogs, and lambs with soft corn, breeding fattening sows, swine breeding of inbred lines, ground eggshell for fattening pigs, and wool yield on Notail sheep; dairy production, including studies of bloat in cattle, treatments for bovine mastitis, and feeding soft corn to milk cows; livestock diseases and poisoning, including selenium studies, sheep parasites, fowl cholera control, causes of cornstalk disease, nitrate accumulations in wheat and oats, and causes of shipping losses in lambs; poultry production, including the hatchability of turkey eggs, vegetable protein ration, and self-harvesting v. hopper feeding of turkeys; fruits and vegetables, including new varieties of pears and apples, tomato varieties and diseases, breeding sweetcorn, cultural studies with lettuce, strawberries, and raspberries, and diseases of deciduous trees in shelterbelts; substations, including rations for beef cattle, alfalfa breeding, fertilizers for grasses, lamb feeding, and swine breeding; crop insects, including grasshopper investigations and DDT for controlling flies and garden insects; farm engineering, including storage of ear corn of high moisture content, use of tractor-mounted machinery, soil stabilizers in rammed earth walls, hard-surfaced floors for steers and poultry, fence post coverings, and sorghum grain storage; home economics, including durability of re-used wool and wool serge, and ascorbic acid and carotene content of peas; farm income and community welfare, including studies of farm records, and factors contributing to farming success, danger in high land prices, marketing studies, and the leasing of livestock farms.

MISCELLANEOUS

Science and scientists in the Netherlands Indies, edited by P. HONIG and F. VERDOORN (*New York City: Bd. Netherlands Indies, Surinam and Curaçao, 1945, pp. 491+*, *illus. 134*).—In this volume the editors have "endeavored to present a picture of the development and status of a number of branches of the natural sciences, pure and applied, in the Netherlands Indies." It consists of original articles, reprints, a number of travel accounts and impressions by distinguished visitors in the past, a number of shorter articles, and a list of scientific institutions, societies, and workers in the Netherlands Indies at the time of the Japanese invasion. The volume contains information on a wide variety of subjects, among which are livestock and veterinary services, mineral resources, climate and meteorological research, geology, soils, volcanology and earthquakes, prehistoric research, fish and fisheries, agriculture, cinchona, the rubber industry, forestry, botany, zoology, astronomy, medical contributions, the various institutions and their work, and many other subjects as related to the country.

Chronica Botanica calendar, 1945 (*Chron. Bot.*, 9 (1945), No. 2-3, pp. 77-250+, *about 40 illus.*).—This special issue contains a paper on The Economic Structure of the Post-War World, by H. C. and A. D. Taylor (pp. 77-85) and various special subject sections. A plant science forum includes contributions on plant geographical stations, what is *Zea mays*, new organic insecticides, Sir Joseph Banks and botany, pollen analysis, priority in biological nomenclature, work of botanists on cinchona in Colombia and Ecuador, chemistry and technology of oils and fats, botanical study for servicemen, marine algae in commerce, types of angiosperm embryo development, biological flora of the British Islands, scientific publications and the indexer, St. Hilaire's records of damage by wheat rust, the genus *Aloe*, "l'annedda"—the arborescent conifer used by Cartier against scurvy, and the need for a monograph of the date varieties. Quotations are included on the organization of biology and agriculture, botanical progress—an editorial of 50 yr. ago, Washington, D. C., during the first World War, problems in tropical deterioration, the present state of plant breeding in forestry, emergency food manuals, and the United Nations Food Conference. Further sections deal with international relations, botanical news, biographical sketches, reviews of books and pamphlets, and notices and queries. A subject index to this special issue is provided.

Den Svenska lantbrukslitteraturen, I, II [Swedish agricultural literature, I, II], P. M. HEBBE (*Uppsala: K. Lantbr. Akad., 1939, vol. 1, pp. 333+*; *Stockholm: K. Lantbr. Akad., 1945, pp. 372+*, *illus. 1*).—Volume 1 of this bibliography deals with the literature prior to 1800, volume 2 with the period 1801 to 1850.

Dixon Springs Experiment Station: What it is doing to develop agriculture in southern Illinois, H. P. RUSK, W. L. BURLISON, R. F. FUELLEMAN, W. G. KAMMLADE, and R. J. WEBB (*Ill. Agr. Col. Ext. Cir. 586 (1944), pp. 31, about 20 illus.*).—This is an account of work "going forward to test, to develop, and to demonstrate farm practices which, besides being immediately profitable, will also build up the fertility of the land." The studies include work with pastures, beef cattle, sheep, and turkeys.

Farm and Home Science [December 1945] (*Farm and Home Sci. [Utah Sta.]*, 6 (1945), No. 3, pp. 16, *about 20 illus.*).—In addition to several articles noted elsewhere in this issue, this number contains A Market for Farm Products, by G. T. Blanch (pp. 1, 13-14); Rural Rich County Sets the Pace for the Counties of Utah in Home Radios, by J. A. Geddes (p. 4), containing data supplementing those noted in Bulletin 321 (E. S. R., 94, p. 529); and the Functions of Organic Matter in the Soil, by J. E. Greaves (pp. 15-16).

NOTES

Connecticut [New Haven] Station.—Dr. Lawrence C. Curtis, geneticist, resigned February 1 to accept a position as associate professor of vegetable gardening in the University of Connecticut, where he will divide his time equally between research and teaching. Oliver E. Nelson, Jr., research technologist in genetics, has resigned to accept a position as plant breeder with a commercial seed company. Dr. Raimon L. Beard, entomologist, has been given a year's leave-of-absence, beginning March 4, to work with the National Research Council in Washington, D. C. Boyd Pack has been appointed plant physiologist in the Tobacco Substation.

Maine Station.—A tract of 30 acres of land in Jonesboro has been bought for the use of the station in its experimental work in blueberry culture. State funds of \$25,000 are available for the purchase of land and equipment, erection of buildings, and cost of operation for the first two years.

Massachusetts Station.—Dr. F. V. Chandler of the U. S. D. A. Cranberry Investigations has been appointed research professor at the Cranberry Substation at East Wareham.

Cornell University and Station.—The Statler Foundation has contributed \$1,000,000 for a building to house the hotel department, the University Faculty Club, and laboratories for research in large- and small-quantity food preparation, hotel engineering, ventilation, air conditioning, steam and electric power, and related subjects.

Dean Sarah Gibson Blanding of the College of Home Economics has been appointed President of Vassar College, effective in September 1946. Dr. Frances Johnston has been appointed associate professor of foods and nutrition vice Dr. Millicent L. Hathaway. Jeffrey Dawson has been appointed associate professor of biochemistry.

New York State Station.—A second shipment of 500 cuttings of apples, pears, cherries, peaches, and grapes has been made to the Polish Experiment Station at Skierniewice.

Robert F. Carlson has resigned as research associate in pomology to accept a similar position in the Michigan College and Station. Dr. Otis F. Curtis, associate physiologist at the U. S. D. A. Date Garden at Indio, Calif., has been appointed assistant professor of pomology.

Pennsylvania College and Station.—The retirement on January 31 is noted of Dean S. W. Fletcher after over 45 years' noteworthy services in horticulture and as an administrator of agricultural education and research in the Washington College, West Virginia University, Cornell University, and the Michigan College, the Virginia Station, and since 1916 in Pennsylvania; and of Dr. S. I. Bechdel, associated with the U. S. Department of Agriculture from 1911-13 and subsequently with the dairy research and related work in Pennsylvania. Dr. T. B. Keith, assistant professor of animal husbandry, resigned on February 28 to accept a position in animal husbandry in the Montana College and Station; Harold M. Steiner, associate professor on economic entomology, on March 1 to engage in commercial work; and E. W. Schroeder, assistant professor of agricultural engineering, on March 13 to conduct research in agricultural engineering for the Tennessee Valley

Authority. R. U. Blasingame, head of the department of agricultural engineering, and Dr. R. A. Dutcher, head of the department of agricultural and biological chemistry, have returned from postwar assignments in Europe.

Maurice G. Kains, head of the department of horticulture from 1914-16, and widely known as an author and horticultural consultant, died February 25 in Suffern, N. Y., aged 77 years. A native of Ontario, Canada, he was graduated from the Michigan College in 1895 and received in 1896 and 1897 the B. S. A. and M. S. A. degrees from Cornell University. He was the author of 27 books, one of them—*Five Acres and Independence*—having had an especially large sale.

U. S. Advisory Committee on Scientific Personnel and Science Training Group.—In view of the increasing importance of scientific research in the Government and because of the expected shortage of scientific graduates from universities and colleges over the next four or five years, an Advisory Committee on Scientific Personnel, with representation from different Government agencies, was set up in 1945 as an official Government committee to advise the U. S. Civil Service Commission on the problems arising in meeting the needs of modern scientific work in the Government. The committee's functions are to review the problems of scientists in the Government and try to work out solutions for them, to devise means of pooling the scientific resources of the various Governmental scientific units, and to facilitate the advanced scientific training of scientific and technical personnel. Dr. M. H. Trytten of the National Research Council was appointed as chairman.

This committee has set up two subcommittees, one on civil service rules and regulations relating to scientific personnel in Government, and another known as the science training group. The latter group is composed of representatives of scientific agencies of the Government in the Washington area, and has the duty of assisting the Government in plans and programs for continuing education of scientific and technical personnel in the Federal service. It aims to serve as a clearing house where the educational needs of scientific and technical workers in the areas can be summed up and analyzed and through which the resources and facilities for advanced scientific and technological education existing in the Washington area can be pooled cooperatively and made available to meet these needs.

Dr. Marsh W. White, of the War Department, has been designated as chairman of the group, with Dr. Philip N. Powers, of the Navy Department, executive secretary. For the Department of Agriculture the representatives are: Howard P. Barss, F. C. Bishopp, H. F. Eisele, C. E. Kellogg, and L. H. Rohrbaugh. The other agencies represented are the Departments of Commerce, Interior, Navy, and War, and the Federal Security Agency.

The first work of the science training group was to canvass these various agencies, early in 1946, to determine what were the current advanced training needs recognized by the workers themselves. The group then prepared a list of advanced courses in scientific fields already available at the universities, Governmental scientific agencies in the Washington area, and in U. S. Department of Agriculture Graduate School, and provided interested Government workers with this information. The group has also begun to study the feasibility of making arrangements with universities and other agencies to broaden the range of graduate courses offered in the Washington area so as to include courses that are needed in various scientific fields but that are not now available.

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RECENT WORK IN AGRICULTURAL SCIENCE¹

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Advances in nuclear chemistry and theoretical organic chemistry, edited by R. E. BURK and O. GRUMMITT (*New York: Interscience Pubs., 1945, pp. 165+*, *illus. 37*).—Essentially similar in plan to the two preceding groups of lectures (E. S. R., 90, p. 145), the present volume contains discussions of the following topics, with a brief bibliography attached to each: Isotopes and Their Applications in Biochemistry, by A. S. Keston (pp. 1-18); Applications of Isotopes in Catalytic Reactions at Surfaces, by H. S. Taylor (pp. 19-42); Techniques in Nuclear Physics, by H. R. Crane (pp. 43-61); Resonance and Organic Chemistry, by L. G. S. Brooker (pp. 63-136); and The Hydrogen Bond and Its Significance to Chemistry, by W. H. Rodebush (pp. 137-161) (Univ. Ill.).

Chemistry of pectin and pectic enzymes (*New York State Sta. Rpt. 1945, p. 26*).—In a study of the important changes in the pectic constituents of the tomato, the authors found the pectinesterase of this plant to differ in its characteristics and behavior from the corresponding esterases produced by other plants. The authors developed, in this work, a method for removing completely the esterase activity from pectinase preparations containing pectinopolygalacturonase.

In work on changes occurring in the pectic constituents of apples, ascorbic acid and peroxides, especially when present together, were found able to break down pectinic acids and to change insoluble pectic constituents into soluble ones. This combination of compounds performed, therefore, "the function usually attributed to the hypothetical enzyme 'protopectinase.'"

The acylation of pectin, J. F. CARSON, JR., and W. D. MACLAY. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 67 (1945), No. 5, pp. 787-789*).—A technic for the esterification of pectin is described. Pectin diacetate, dipropionate, and dibutyrate were

¹The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details will be supplied on request.

prepared by esterification of citrus pectin with the acid anhydride in pyridine. Lauroyl, myristoyl, palmitoyl, and benzoyl esters of citrus pectin were prepared by esterification of pectin with the corresponding acid chloride in pyridine; the degree of esterification attained varied from 1.2 to 1.6 acid groups per anhydrogalacturonic acid unit.

Enzymic preparation and extraction of pectinic acids, H. S. OWENS, R. M. MCCREADY, and W. D. MACLAY. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 10, pp. 936-938, illus. 3).—The presence of a pectin esterase in citrus fruit peel has made it possible to develop an efficient procedure for the manufacture of a series of pectinic acids employing the enzyme *in situ*. The partially de-esterified pectins extracted from the raw material formed very viscous solutions indicative of long-chain molecules. The pectins so modified were found to differ from pectic substances now commercially available, and to offer promise of a wide range of usefulness where oil-resistant and water-soluble films are needed. It was found that various salts differ in solubility characteristics and offer other possibilities for use. The conditions for the preparation of a series of pectic substances are described and several uses suggested.

Oriented fibers of sodium pectate, K. J. PALMER and H. LOTZKAR. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 5, pp. 883-884, illus. 1).—Having learned from X-ray powder photographs that sodium pectate is markedly crystalline, the authors prepared sodium pectate fibers having molecular orientation, with a view to X-ray diffraction photograph measurements and structural analysis. It was found best to prepare first a pectic acid fiber and then to convert the acid in this form to its sodium salt.

A successful method for making well-oriented sodium pectate fibers consisted of titrating a 1 percent solution of pectic acid to a pH of 5.0 with sodium hydroxide. The resulting solution was then forced through a 1-mm. nozzle into a coagulating bath consisting of 85 percent ethyl alcohol in 1 N hydrochloric acid. The resulting wet fiber was strong enough to be handled readily. The hydrated fiber was held in a 60 percent alcoholic, 0.1 N sodium hydroxide solution overnight and then immersed for 24 hr. in 60 percent ethyl alcohol. The fiber was then removed and slowly elongated 38 percent while drying. The dry fiber was strong, pliable, showed good molecular orientation, and was remarkably crystalline. The layer line spacings in the X-ray photograph were readily measurable. The identity period in the direction of the fiber axis was determined as approximately 13.1 a. u., a value lying between the maximum (10.4 a. u.) observed for an identity period of two pyranose rings and the value (15.2 a. u.) observed for a period of three such rings. "The symmetry of the galacturonide chain in pectin evidently approximates that of a threefold screw axis but with the angle between the plane of the pyranose rings and the fiber axis somewhat larger than occurs in cellulose and its derivatives. The threefold screw axis is also suggested by the fact that the sodium pectate fiber diagram can be indexed on a hexagonal lattice."

The reaction of formaldehyde with proteins, H. FRAENKEL-CONRAT, M. COOPER, and H. S. OLCOTT. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 6, pp. 950-954).—In 4 percent solution, at pH 3 to 7 and 70° [C.], formaldehyde combined with both the primary amino and the primary amide groups of proteins. In contrast to conclusions of other investigators, the secondary amide linkages of the peptide chain and the phenolic groups were found not to bind appreciable amounts of formaldehyde. These findings were confirmed in experiments with protein derivatives and synthetic polypeptides containing a maximal or minimal number of reactive groups.

The preparation of a polypeptide rich in primary amide groups from polyglutamic acid is described. This material bound more formaldehyde than did any of the proteins investigated.

Soybean protein production: Comparison of the use of alcohol-extracted with petroleum-ether-extracted flakes in a pilot plant, P. A. BETTER, A. C. BECKEL, and A. K. SMITH. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 9, pp. 799-803, illus. 4).—In a first report on soybean protein production in a pilot plant, the authors showed that extraction of soybean flakes, separation of suspended solids from the dispersion, and precipitation and dewatering of the protein could be made a satisfactory process. The fractions into which the soybean flakes are separated during the processing, as well as their sizes, are given. A comparison of the production of protein from flakes resulting from the extraction of the oil with petroleum ether in one case and alcohol in the other is made. The superiority of ethanol-extracted flakes for processing soybean protein is noted.

The proteolytic inhibiting substance in the extract from unheated soy bean meal and its effect upon growth in chicks, W. E. HAM, R. M. SANDSTEDT, and F. E. MUSSEHL. (Nebr. Expt. Sta.). (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 635-642, illus. 4).—The proteolysis inhibiting substance present in unheated soybean meal had a retarding effect upon the growth of chicks when given either with a ration containing autoclaved soybean meal or with one containing a supplement composed of nutritionally adequate proteins from animal sources. The proteolysis inhibitor had a greater effect on growth when fed with a ration supplemented with soybean protein than when fed with a diet supplemented with more complete animal proteins. When the contents of the small intestines of chicks receiving a diet of raw soybean meal were used as the enzyme on a substrate of 5 percent casein (pH 7.5), proteolytic action was greatly retarded as compared with the action of the intestinal contents from chicks receiving a diet of autoclaved soybean meal. It was possible to precipitate the proteolysis inhibiting substance from water extracts of the intestinal contents of chicks that had been fed uncooked soybean meal. An explanation for the apparent greater methionine deficiency of raw soybean meal as compared to autoclaved meal is given.

Preparation of zein by precipitation method, C. D. EVANS, R. J. FOSTER, and C. B. CROSTON. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 2, pp. 175-177, illus. 3).—A laboratory procedure for the preparation of zein from corn gluten consists in extracting with isopropyl alcohol, concentrating to a heavy phase solution, precipitating from the heavy phase solution into cold water, and drying the resulting protein at low temperatures. The zein from the dilute alcoholic extract is concentrated to a heavy zein phase by a nonpolar solvent which selectively removes part of the alcohol from the extract. Precipitation of the zein from its heavy phase solution is accomplished by throwing a fine stream of it into cold water with an effective rotary dispersing apparatus. This precipitate is finely divided, granular, and free from the occluded solvent which proves so troublesome in conventional laboratory methods of preparing zein. Curves showing the phase relations of mixtures of alcoholic zein solutions and petroleum ether which are important in the concentration are discussed. The method was found also suitable for the recovery of modified zein preparations.

Ternary solvents for zein, C. D. EVANS and R. H. MANLEY. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 5, pp. 408-410, illus. 2).—The authors classify zein solvents broadly as primary solvents, capable in themselves of dispersing zein; secondary solvents, which do not themselves disperse the protein but can contribute to the solvent power of the primary solvents in binary mixtures; and diluents, without either primary or auxiliary solvent effect. Structural characteristics which place a solvent in one or another of these groups are discussed. Trilinear diagrams show the critical peptization temperatures observed in each of 18 ternary mixtures of solvents and diluents.

Conduct of amino acids in synthetic ion exchangers, D. T. ENGLIS and H. A. FRIESS. (Univ. Ill.). (*Indus. and Engin. Chem.*, 36 (1944), No. 7, pp. 604-609,

illus. 6).—The reactions of representative amino acids with various forms of synthetic ion-exchange materials were studied. All amino acids tested reacted with the hydrogen form of the cation exchangers. With the use of the column method, the capacities of two commercial exchangers for glycine, leucine, norleucine, phenylalanine, tryptophan, hydroxyproline, glutamic acid, asparagine, and lysine hydrochloride were determined. A fairly uniform capacity of each individual exchanger, in terms of equivalents of the acids examined, suggested that their removal proceeded essentially by salt formation between the basic amino group and the acid form of the exchanger. This condition was substantiated by the fact that static studies of the adsorption of glycine from solutions containing varying amounts of HCl showed decreasing removal as the pH was lowered, and by the fact that the calcium and sodium forms of cation exchangers either did not react or reacted slightly with amino acid. Addition of formaldehyde to the amino acid solutions had little effect upon their reaction with the hydrogen form of the exchangers. Adsorption of the nine amino acids by the hydrogen exchangers was studied by static methods also. Previous equations for treating the data were not entirely applicable, in part because of the diverse acidic groupings and consequent inhomogeneity of the exchangers. Two anion exchangers were found to react with dicarboxylic acids but not with the monocarboxylic. The hydrochlorides of the basic amino acids were not removed by the anion exchangers.

On the presence of a proteolytic enzyme in casein, R. C. WARNER and E. POLIS. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 4, pp. 529–532, *illus. 3*).—Casein was found to contain an enzyme that causes its slow hydrolysis accompanied by a decrease in the viscosity of its solutions and the appearance of nitrogenous products soluble at pH 4.6 and in trichloroacetic acid. The enzyme was present in all samples of commercial casein examined and in all laboratory preparations made by the usual methods.

The effect of manganese compounds and certain other factors on the formation of thyroxine in iodinated casein, E. P. REINEKE and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 613–619, *illus. 1*).—The effect of a number of factors on the formation of thyroxine in iodinated casein, as determined by chemical analysis, is reported. It was found that subsequent to the iodination of the protein the quantity of thyroxine formed is increased markedly by increasing the incubation temperature to 70° [C.] and agitating the solution very vigorously. The principal effect of agitation is believed to be the incorporation of atmospheric oxygen, which then brings about oxidative coupling of 2 molecules of diiodotyrosine within the protein to form thyroxine. The formation of thyroxine was found to be catalyzed by a series of manganese compounds, including MnSO_4 , Mn_2O_4 , Mn_2O_3 , MnO_2 , and the oxides of manganese obtained by the reduction of KMnO_4 by glucose. Best results were obtained with the latter compounds and with Mn_2O_4 . It was also found that by the use of a larger excess of sodium bicarbonate than was employed in the earlier experiments a larger quantity of iodine can be added to the protein before a decline in thyroxine formation takes place. The thyroxine formation at the point of optimum iodination was in this way increased beyond that observed under the former conditions.

From these results, together with the reported capacity of the thyroid for storing manganese, it is concluded that manganese may act catalytically, in vivo as well as in vitro, in promoting the oxidative formation of thyroxine in the thyroid gland.

Ribonucleinase, I, II (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 519–533, *illus. 2*).—Both of the two papers here noted deal with results obtained by means of a manometric determination of the carbon dioxide liberated from a bicarbonate solution by mononucleotides set free by the action of the enzyme upon ribonucleic acid, a method attributed to Bain and Rusch.

I. *Manometric determination of ribonucleinase in blood and tissues of the rat and the rabbit*, C. A. Zittle and E. H. Reading (pp. 519-525).—In determinations of the ribonucleinase contents of the blood, the plasma, and the blood cells of the rat and the rabbit, the enzyme was found to be located mostly in the blood cells. Results of determinations of the same enzyme in the bone marrow, the spleen, and the pancreas of both animals are also discussed. Solubility studies gave further evidence to the effect that the nucleic acid is broken down by the blood.

II. *Mononucleotides in commercial ribonucleic acids and their effect on ribonucleinase*, C. A. Zittle (pp. 527-533).—The difference in reactivity between the two types of commercial nucleic acids preparations (free acid and sodium salt) with ribonucleinase was correlated with the difference in mono- and tetranucleotide content. The increased reactivity of the free acid with ribonucleinase after precipitation with acetic was ascribed to the removal of these substances, since ribonucleinase was inhibited by a mixture of mononucleotides, by adenylic and by guanylic acids, and since the tetranucleotides are generally less reactive than a polynucleotide. The inhibition of the activity of ribonucleinase by the mononucleotides is held probably to have been due to a competition of the mononucleotides with the substrate for the enzyme. Various concentrations of the nucleic acid produced about the same degree of inhibition.

The isolation of kaffiroic acid from kafir bran, L. L. Woods and C. W. Colver. (Kans. State Col.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 4, pp. 653-654).—A new acid, designated kaffiroic acid, was found in kafir bran. Kaffiroic acid, a brown nitrogenous compound, was found to be present to the extent of 8.53 percent of the dry weight of the bran used. The acid was easily attacked by alcoholic potassium hydroxide and strong acids which produced 5-aminopentanoic acid or one of its salts.

Microphotometric determination of the rate of enzymatic proteolysis, P. C. Zamecnik, G. I. Lavin, and M. Bergmann (*Jour. Biol. Chem.*, 158 (1945), No. 3, pp. 537-545, illus. 7).—The authors describe in detail and illustrate in a drawing an assembly comprising a voltage stabilizer, a multiple mirror galvanometer, a micro switch circuit breaker, a mercury arc light source, a filter for the principal green line of this light source, a micro burette of the screw and mercury piston type, and a micro titration vessel (micro cuvette), electromagnetically stirred and placed between the light filter and a copper-oxide photoelectric cell, and various accessories.

Titration of an amino acid or peptide was carried out with alcoholic hydrochloric acid, in a 90 percent acetone medium containing naphthyl red as an indicator. Change of the indicator from yellow to red caused an abrupt decrease in light transmission and this decrease was quantitatively indicated by the galvanometer. This method of titration revealed a possible source of error which may interfere with the titration when one of the split-products of the enzymatic cleavage buffers the system against pH changes more effectively than does the original peptide.

Some properties of synthetic codecarboxylase, I. C. Gunsalus, W. W. Umbreit, W. D. Bellamy, and C. E. Foust. (Cornell Univ.). (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 743-744).—The authors prepared the coenzyme by the action of phosphorus oxychloride upon pyridoxal, and purified their product by means of its barium salt, soluble in water but not in alcohol.

The absorption spectrum of a sample prepared by this method differed from that of pyridoxal largely in the lack of an absorption band at 300 m μ in alkaline solution, the absorption spectrum of pyridoxal in the ultraviolet being similar to that of pyridoxine. Synthetic codecarboxylase did not give a phenol reaction by the chloroimide method, which is positive for pyridoxal. The sample contained 6.2 percent organic phosphorus, 32 percent pyridoxal by spectrum (1 atom of phosphorus per mole of pyridoxal), and about 50 percent barium. The coenzyme activity was about 18 times that of the standard used in the assay system. This afforded confirma-

tion of data on codecarboxylase formation from members of the vitamin B₆ group by growing cells. Upon hydrolysis in N HCl at 100° [C.], the codecarboxylase activity was destroyed, with a corresponding release of inorganic phosphate, appearance of a phenolic reaction, and increased in absorption at 300 mμ in alkaline solution.

Itatartaric acid, a metabolic product of an ultraviolet-induced mutant of *Aspergillus terreus*, F. H. STODOLA, M. FRIEDKIN, A. J. MOYER, and R. D. COGHILL. (U. S. D. A.). (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 739-742).—About 5.8 percent of the total acids produced by an ultraviolet-induced mutant of *A. terreus* was shown to be an equilibrium mixture of itatartaric acid and its lactone. It is noted that these compounds have not previously been found to occur naturally.

Production, concentration, properties, and assay of the antibiotic subtilin (U. S. Dept. Agr., Bur. Agr. and Indus. Chem., 1946, AIC-106, pp. 7).—Subtilin, an antibiotic produced by certain strains of *Bacillus subtilis*, was investigated as a possible product in the utilization of waste vegetable materials as culture media. Production of the antibiotic as here discussed was performed upon culture media prepared from waste asparagus butts, and purification was carried to the point of activity about 100 times that of the original micro-organismal pellicle. Subtilin appeared to have relatively low toxicity and to be suitable for therapeutic experiment. This report deals with production of the pellicle and with the concentration, solubility, stability, and microbiological assay of subtilin.

Chemical-catalytic liquid-phase oxidation of—nicotine, β-picoline, and quino-line to nicotinic acid, C. F. WOODWARD, C. O. BADGETT, and J. G. KAUFMAN. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 6, pp. 544-546).—The authors report upon the development of a method involving the oxidation of the bases named by sulfuric acid, with selenium as the catalyst, and at a temperature of from 250° to 330° C. The maximum nicotinic acid yield from β-picoline approximated 50 percent of the theoretical, and that from both nicotine and quino-line was about 75 percent of theoretical. This method of oxidation was found to be an improvement in some respects over previously known procedures, although the high reaction temperature was a disadvantage. It is believed that selenium contamination can be satisfactorily minimized or even eliminated.

Catalytic vapor-phase oxidation of—nicotine to nicotinonitrile, C. F. WOODWARD, C. O. BADGETT, and J. J. WILLAMAN. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 6, pp. 540-544, illus. 4).—Nicotinonitrile was obtained in yield reaching a maximum of 51.5 percent of the theoretical by a vapor-phase air oxidation of nicotine over vanadium pentoxide. Because of the shortness of the space in the catalyst bed which was kept at the maximum temperature, the oxidation was believed to have been of the "flash" nature, the reaction appearing to take place instantaneously and with complete utilization of the nicotine.

It is pointed out that since nicotinonitrile may be readily hydrolyzed to nicotinic acid or nicotinamide in excellent yields, a new process has been made available for niacin or niacinamide.

Catalytic vapor-phase oxidation of picolines over vanadate catalysts, R. W. LEWIS and O. W. BROWN (*Indus. and Engin. Chem.*, 36 (1944), No. 10, pp. 890-893, illus. 1).—The authors report upon experiments on the vapor phase oxidation of β-picoline by atmospheric oxygen with five metal vanadates as catalysts. Attention was given mainly to the β-isomer because of the importance of the oxidation product, nicotinic acid. It was observed, however, that the α- and γ-picolines were similarly oxidized in the presence of the most efficient (tin) vanadate catalyst, yielding the corresponding pyridine carboxylic acids. Favorable working conditions of each catalyst were determined by studying the effect of temperature, ratio of reactants, and velocity of reactants over the catalyst. The best results were obtained over a tin vanadate catalyst which gave 22.6 percent nicotinic acid at 275° C., with a 9 to 1 mole ratio of oxygen to β-picoline.

Lactic acid condensation polymers: Preparation by batch and continuous methods, E. M. FILACHIONE and C. H. FISHER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 3, pp. 223-228, illus. 6).—The preparation, properties, and reactions of condensation polymers of lactic acid are reviewed. Batch and continuous methods for converting lactic acid into its condensation polymers are described. Removal of water during the dehydration or self-esterification of lactic acid was facilitated by relatively high temperature, reduced pressure, sulfuric acid, or a similar esterification catalyst, and an entraining agent, such as benzene or toluene. The resulting condensation polymers, which react readily with methanol, were useful for making methyl lactate.

Adsorption of riboflavin by lactose: Influence of temperature, A. LEVITON. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 8, pp. 744-747, illus. 1).—To utilize the productive capacity of existing milk sugar plants for the manufacture of adsorbates, it is necessary to establish conditions for the controlled preparation of these adsorbates. The purpose of this paper is to furnish data to operators for the establishment of these conditions. The range of concentrations and temperatures studied included those which would be encountered in the manufacture of adsorbates from grain curd casein whey and are applicable to a wide range of operating conditions. Although the data are considered primarily from the standpoint of their practical application, a number of problems of both theoretical and practical interest are considered.

Aliphatic esters of the 9,10-dihydroxystearic acids, D. SWERN and E. F. JORDAN, JR. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 6, pp. 902-903).—The 9,10-dihydroxystearic acids melting at 95° [C.] and at 130° were esterified, by the aid of naphthalene- β -sulfonic acid, with *n*-propyl, *n*-butyl, *i*-butyl, *n*-amyl, *n*-hexyl, *n*-octyl, *n*-decyl, *n*-dodecyl, *n*-tetradecyl, *n*-hexadecyl, *n*-octadecyl, and 9,10-dihydroxy-octadecyl alcohols. For the esterification of the higher alcohols, benzene was added to the reaction mixture, which was refluxed under conditions arranged for the azeotropic distillation of the water liberated (in quantitative proportion to the weights of reactants) during the reaction, the benzene being returned to the reaction mixture. The normal alcohols yielded from 50 to 69 percent of the theoretical quantity, the *i*-butyl alcohol 18 percent, of the esters of the acid of the higher melting point. With the acid melting at 95°, somewhat lower yields were obtained. Melting points and some analytical data of the resulting esters are tabulated. The esters were solids of rather high melting point and of very low vapor pressure. Their possible usefulness as plasticizers or as high melting point waxes is suggested.

Methacrylic esters of glucose and other carbohydrates, R. H. TREADWAY and E. YANOVSKY. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 6, pp. 1038-1039).—The authors note that although methacrylic esters of lower aliphatic alcohols have been of technical importance for some time, none has been prepared with methacrylic anhydride. They describe the preparation and properties of glucose pentamethacrylate, of maltose octamethacrylate, of dextrin trimethacrylate, and of a starch methacrylate. These substances were readily polymerized on solution by benzoyl peroxide, by copper naphthenate, or polymerized spontaneously on standing, becoming less soluble or insoluble. Brief heating at 100° C. insolubilized the glucose and maltose derivatives. The dextrin derivative became insoluble on exposure to air; the starch derivative, slightly soluble in pyridine and in tetrachloroethane in its original state, became quite insoluble on exposure to air or when heated for a short time.

Methyl acrylate production by pyrolysis of methyl acetoxypionate, C. H. FISHER, W. P. RATCHFORD, and L. T. SMITH. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 3, pp. 229-234, illus. 2).—Contact and construction materials previously used in the pyrolysis of esters are listed. A preliminary investigation of the influence of various metals, alloys, and other materials upon the production of

methyl acrylate by the pyrolysis of methyl acetoxypionate is reported. Quartz, Pyrex, carborundum crystals, copper, carbon rods, crushed coke, and other relatively inert substances were satisfactory as packing for the pyrolysis tubes. Although the use of inert packing or contact materials appeared beneficial on the basis of equal contact times, the effect was slight and even questionable when considered on the basis of equal addition rates. Nickel, Monel, alumina, silica, and iron actively catalyzed conversion of methyl acetoxypionate into gas and carbonaceous material. Iron inactivated by intermittent treatment with steam was used satisfactorily in the pyrolysis. Small quantities of water in the methyl acetoxypionate also inactivated the iron, but the formation of methyl acrylate was retarded simultaneously. Stainless steel (18 percent chromium-8 percent nickel) and 4-6 percent chromium steel appeared suitable for the pyrolysis of methyl acetoxypionate.

Preparation of methyl acetoxypionate: Reaction of lactic acid with methyl acetate, C. E. REHBERG, W. A. FAUCETT, and C. H. FISHER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 5, pp. 469-472, illus. 1).—The authors show that lactic acid could be made in almost unlimited quantities by fermentation of abundant, low-cost carbohydrates. A one-step method for transforming lactic acid into methyl acetoxypionate is described. The reaction between lactic acid of various concentrations and methyl acetate was studied under different conditions to determine the effect of variables on the yield of methyl acetoxypionate. Both methyl lactate and methyl acetoxypionate were produced. Under some conditions 63.6 and 28.4 percent yields, respectively, of methyl lactate and methyl acetoxypionate were obtained. This preparation of methyl acetoxypionate required less acetic anhydride or ketene than the customary method, which consisted in treating methyl lactate with either acetic anhydride or ketene. Physical and chemical properties of methyl lactate and its azeotrope with water are described.

Acetylation of alkyl lactates: Methyl and ethyl alpha-acetoxypionates, M. L. FEIN and C. H. FISHER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 3, pp. 235-238, illus. 1).—The authors point out that methyl acetoxypionate, the acetyl derivative of methyl lactate, is an important intermediate because it yields methyl acrylate on pyrolysis. The present paper describes simple and efficient methods for acetylating methyl lactate with acetic anhydride, ketene, and acetyl chloride. Methyl lactate was acetylated continuously and in high yields with acetic anhydride and ketene. Large-scale laboratory apparatus suitable for preparing methyl acetoxypionate continuously at rates as high as 95 lb. per 24-hr. day is described.

The borates of 2,3-butylene glycol, S. A. MORELL and E. C. LATHROP. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 5, pp. 879-880).—By heating together a 1:1 or a 2:1 mixture of orthoboric acid and *meso*-2,3-butylene glycol with benzene under conditions providing for azeotropic removal of the water of reaction, the authors obtained 58 percent and 53 percent yields, respectively, of the mono-acid borate of the glycol. Under similar conditions of reaction, but with a 2:3 molar ration of boric acid to the glycol, they obtained a 90 percent yield of the diorthoborate of *meso*-2,3-butylene glycol. Some chemical and physical properties of these two esters are discussed, and the possible bearing of the authors' observations upon discrepancies between the results obtained by certain other investigators in preparing borates of the glycol in question is indicated.

Preparation of pituitary thyrotropic hormone, L. S. CIERESZKO (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 585-592).—The author describes a relatively simple procedure which consistently yielded significant quantities of a thyroid-stimulating product having a degree of physiological activity greater than that of any preparation previously described. This material, obtained with good recovery of thyroid-

stimulating activity from frozen whole beef pituitary glands. One γ of the thyrotropic preparations obtained by this procedure produced definite histological changes in the thyroids of 3-day-old male White Leghorn chicks. The preparations did not have demonstrable prolactin, gonadotropic, or growth hormone activity. Preliminary observations of the behavior of the preparation in a Tiselius electrophoresis apparatus and in an analytical ultracentrifuge indicated that it was an homogeneous substance.

A selected and annotated bibliography on soft corn and pertinent information on the drying, preservation, and storage behavior of corn and other grains, C. M. JAEGER, J. H. SHOLLENBERGER, and M. M. MACMASTERS (*U. S. Dept. Agr., Bur. Agr. and Indus. Chem., 1945, AIC-100, pp. 48+*).—The scope of this collection of references and abstracts is rather wider than is fully indicated in the title. A brief abstract accompanies each title cited.

Part 1, Soft Corn, has the subdivisions: Definition (two entries indicating the moisture percentage range and physical condition considered to define soft corn); physical and chemical characteristics; handling and utilization; drying (one entry, indicating the best drying method as that of leaving the corn in the field until it is dry enough to crib); and use of preservatives. Part 2, Other Corn, contains references on drying and physical and chemical changes during storage. Part 3, Other Grain or Seeds, has the subheadings of drying; use of preservatives; and physical and chemical changes occurring during storage (numerous references, covering grains, soybeans, flax and sunflower seeds, etc.). An author index is appended.

Glutinous corn and sorghum starches, M. M. MACMASTERS and G. E. HILBERT. (*U. S. D. A.*). (*Indus. and Engin. Chem., 36 (1944), No. 10, pp. 958-963, illus. 4*).—The compositions of various glutinous and nonglutinous varieties of corn and sorghum have been determined. In general, the glutinous varieties were found to contain less starch and more oil and protein than the nonglutinous. The types of glutinous corn could be easily processed for high-quality starch by a method similar to that used for making cornstarch, but the adaption of this method to glutinous sorghums containing a nucellar layer yielded off-color starches, although the difficulty was largely overcome by pearling the grain to remove the pigmented layer. Varieties lacking the nucellar layer yielded white starch without the necessity for pearling. Compared to nonglutinous starch, the glutinous type was more sensitive to processing conditions. Excessive grinding and increasing the concentration of the sulfur dioxide in the steeping operation tended to lower the viscosity of the glutinous starch. The gelatinization temperatures of the starch from the glutinous varieties were about the same as those of starch from the nonglutinous. Glutinous starch granules swelled to a greater extent and exhibited a structure different from that of the nonglutinous. The viscosity of glutinous starch pastes was much higher than that of the ordinary type starch paste and was comparable to that of tapioca. Glutinous starch pastes were translucent, flavorless, and "long." Factors involved in the industrial utilization of glutinous starch as a replacement for tapioca starch are discussed.

Allyl ether of starch: Preparation and industrial possibilities, P. L. NICHOLS, JR., R. M. HAMILTON, L. T. SMITH, and E. YANOVSKY. (*U. S. D. A.*). (*Indus. and Engin. Chem., 37 (1945), No. 2, pp. 201-202*).—With use of acetone as solvent to avoid the formation of an insoluble and infusible allylation product, soluble allyl ethers of starch were prepared from starch acetate and also by direct allylation of starch with the use either of allyl bromide, which reacted satisfactorily under reflux, or of allyl chloride, which required autoclave treatment at 80° C. for some hours. It was found that the compound is readily oxidized and polymerized to an insoluble and infusible product. Heat and paint driers accelerate the polymerization. Possible

industrial uses of allyl starch as coatings, adhesives, and plastic intermediates are discussed.

Dextrinization of potato starch with gaseous hydrogen chloride, L. T. SMITH and S. G. MORRIS. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 11, pp. 1052-1054, illus. 3).—Air-dried starch (about 12 percent moisture) readily absorbed hydrogen chloride gas but did not permit penetration of the gas through the mass of starch. Both the absorptive capacity and the resistance to penetration of hydrogen chloride gas decreased with the decrease of moisture in the starch. Starch of 3 to 4 percent moisture content permitted absorption and penetration of sufficient hydrogen chloride gas for dextrinization. Satisfactory dextrans could be prepared from partly dried starch and hydrogen chloride gas under proper conditions of temperature, concentration of catalyst, and duration of dextrinization.

Wheat starch manufacture: A new method, R. L. SLOTTER and C. T. LANGFORD. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 5, pp. 404-408, illus. 3).—The authors report development of a process, analogous to that used in the wet milling of corn, for the extraction of starch and other products from the whole wheat kernel. The quality of the starch from sound wheat was excellent. The starch could be converted to sirups and sugar by methods used in the conversion of cornstarch. Good starch can be extracted from damaged wheat which is otherwise unsuitable for food or feed. Pilot-plant operating data for typical runs using wheat are given. Similar data are presented for processing corn.

Hydrolysis of starch by sulfurous acid, M. HAYEK and R. L. SHRINER (*Indus. and Engin. Chem.*, 36 (1944), No. 11, pp. 1001-1003, illus. 2).—Varying time, temperature, and sulfur dioxide concentration, the authors obtained a nearly complete conversion of starch to glucose in 15 min. at 165° C. in the presence of from 0.2 to 0.4 percent of sulfur dioxide. For a corn mash, the most satisfactory conditions were a 2 percent concentration of sulfur dioxide at 160° for 15 min. For wheat mash the most satisfactory conditions appeared to be a 2 percent concentration of sulfur dioxide at 165° to 170° for 10 min. The sulfur dioxide could be removed and the resulting mash fermented to produce alcohol in good yields.

Gel-forming derivative of wheat gluten, H. C. REITZ, R. E. FERREL, and H. S. OLCOTT. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 12, pp. 1149-1151, illus. 2).—A product obtained from wheat gluten by the action of chlorosulfonic acid and pyridine or cold concentrated sulfuric acid possessed, after neutralization, the property of absorbing rapidly 100 to 300 times its weight of cold water to form a firm, odorless, tasteless, and nontoxic gel. The use of gluten sulfate as a substitute for scarce natural gums in therapeutic jellies, ointments, and other pharmaceutical preparations, and as a thickening agent or emulsifying agent in ice cream or other foods, is suggested. The material has already been used in surgery for the absorption of postoperative drainage.

Commercial peanut meal: Peptization and extraction of nitrogenous constituents and the color comparison of protein solutions, R. S. BURNETT and T. D. FONTAINE. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 3, pp. 284-288, illus. 3).—The authors note that hydraulically pressed peanut meals vary with respect to the peptizability of their nitrogenous constituents. Some are nearly equivalent in solvent-extracted meals, others are definitely inferior. By properly controlled press-room operation, oil can be effectively removed from the peanut with a minimum of change in the nitrogen peptization properties of the resulting meal. Data are presented to show that the nitrogen peptization values for peanut meals can be used as a practical guide in determining the amount of protein which can be separated from a meal. Measurement of the relative special transmittance of peanut preparations in sodium hydroxide solution indicates that proteins of satisfactory color

can be obtained from blanched red-skinned peanuts and from unblanched white-skinned peanuts. The cultivation of white-skinned peanuts for industrial use of their protein appears desirable and feasible.

Properties of peanut meal: Influence of processing factors, T. D. FONTAINE, C. SAMUELS, and G. W. IRVING, JR. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 7, pp. 625-627, illus. 2).—The peptizability of the nitrogenous constituents of white-skin peanuts (Pearl variety) did not differ significantly from that of the usual red-skin varieties. Storage of white-skin peanuts at room temperature for 2 yr. before removal of the oil by solvent extraction did not alter the peptizability of the nitrogenous constituents of the meal. The effect of heat, humidity, and length of treatment on the peptization of the nitrogenous constituents of flaked peanuts and solvent-extracted peanut meal showed that the critical denaturation temperature for peanut protein in the meal, as measured by peptization, laid above 118° C. (dry heat) and above 80° at 100 percent relative humidity. The routine heat treatments employed in a majority of the peanut oil mills were insufficiently controlled to prevent rather drastic denaturation of the meal protein. The data presented indicate that, with proper temperature and moisture control during processing, satisfactory oil removal can be accomplished with a minimum of protein denaturation.

Artificial fibers from corpuscular and fibrous proteins, H. P. LUNDGREN and R. A. O'CONNELL. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 4, pp. 370-374, illus. 11).—The authors note that it is possible to prepare from proteins obtainable from surplus or waste agricultural and industrial products fibers having molecular orientation, strength, and moisture-absorbing properties comparable with those of natural protein fibers. Such fibers were made by means of dispersing agents (sodium alkyl benzene sulfonates) mild as compared with those in common commercial use for protein fiber manufacture. These sulfonates served not only as solvents for the proteins used but also, when used in suitable proportions, to form with the proteins complexes containing unfolded protein micellae. It was further found that dispersions containing complexes of appropriate composition can be used to make fibers, either by passage through a spinneret into a coagulating bath of salt solution or by precipitation with inorganic salt with subsequent drawing of the precipitate into a fiber. The detergent can be recovered with aqueous acetone, leaving the peptide chains in the resulting protein fibers in such a state that they can be oriented by drawing in live steam. Secondary and primary valence cross linkages then occur which hold the peptide chains in a highly oriented condition when the fiber is removed from the steam bath. As the degree of orientation in the fibers is increased, tensile strength and water resistance increase although the range of elastic deformation decreases.

Fanweed seed oil: Potential substitute for rapeseed oil, J. R. CLOFTON and H. O. TRIEBOLD. (Pa. Expt. Sta.). (*Indus. and Engin. Chem.*, 36 (1944), No. 3, pp. 218-219).—The authors found the seed of the fanweed (*Thlaspi arvense*) to contain from 33 to 35 percent of oil. The composition and properties were similar to those of rapeseed oil. Glycerides of both oils were characterized by a high content of crucic acid. Fanweed seed oil glycerides were somewhat higher in linoleic acid than those of rapeseed oil. Viscosities of the two oils at ordinary temperatures were similar, and their changes in viscosity with temperature were comparable. This suggested that fanweed seed oil could be used in place of rapeseed oil as a lubricant constituent and for other industrial purposes.

Viscosities and densities of hydrogenated cottonseed oils, H. WAKEHAM and F. C. MAGNE. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 6, pp. 568-570, illus. 2).—The authors summarize the few and scattered data on this subject

previously published, describe the conditions and methods of their own measurements, and record, for the 14 samples of cottonseed oils used in viscosity and density determinations, the iodine number, melting range, solidification range, the refractive index with temperature from (40° to 60° C.) at which this value was measured, and the free fatty acid content (calculated as percentage of oleic acid) found before and after the n_D determination; the densities of the hydrogenated oils at temperatures ranging from 29.9° to 233.8° and the viscosities (centipoises) of the same materials from 28.5° to 244.4°; comparison of published viscosity data with those of the authors; and a comparison of the viscosities and densities of deodorized and undeodorized hydrogenated cottonseed oils from various batches.

Mechanical properties of films from amylose, amylopectin, and whole starch triacetates, R. L. WHISTLER and G. E. HILBERT. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 9, pp. 796-798, illus. 4).—Amylose and amylopectin triacetates were found to differ greatly in film-forming ability. Amylose triacetate readily formed high-quality films having good tensile strength and pliability; amylopectin triacetate resembled whole starch triacetate in forming only weak, brittle films. Adequate plasticization of the amylose triacetate films could be accomplished by the addition of 10-20 percent of plasticizer of the types employed with cellulose acetates. In general, the properties of the amylose triacetate films were similar to those of cellulose triacetate films. Because of their high quality and low plasticizer requirements, amylose triacetate films appeared well suited to industrial uses.

Tartrates from grape wastes: Use of ion exchangers in acid-carbonate cycle, J. R. MATCHETT, R. R. LEGAULT, C. C. NIMMO, and G. K. NOTTER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 9, pp. 851-857, illus. 11).—The authors point out that a substantial part of the approximately 15,000,000 lb. of tartaric acid annually required in our domestic economy and hitherto imported is potentially available in the wastes of the grape processing industry. Laboratory-scale experiments indicated the commercial feasibility of utilizing synthetic ion-exchange materials for recovery of this and possibly other valuable constituents of the wastes.

The saccharification of agricultural residues: A continuous process, J. W. DUNNING and E. C. LATHEROP. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 1, pp. 24-29, illus. 7).—The authors note that because of the chemical composition and physical properties of agricultural residues, they may find a unique place in the field of industrial saccharification. A continuous process for the saccharification of agricultural residues which makes use of these properties was developed through a large-scale laboratory stage. This process was carried out in a two-stage operation in which the pentosans were first hydrolyzed by dilute acid. The cellulose was then saccharified by a new concentrated acid method using less than one-fourth the amount of acid required by other known concentrated acid processes. The lignin remains as an insoluble residue. The methods employed permitted almost quantitative separation of pentosans and cellulose. The pentosan hydrolysis yielded a 15 to 20 percent xylose solution and the cellulose hydrolysis a 10 to 12 percent dextrose solution. The dextrose, which was obtained in yields of 85 to 90 percent of theoretical, was readily fermented by *Aerobacter aerogenes* and yeast.

Tannin extract from western hemlock bark, E. F. POTTER, K. T. WILLIAMS, T. L. SWENSON, and I. C. FEUSTEL. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 12, pp. 1146-1149, illus. 3).—The authors report upon an improved process for the preparation of tannin extract from the bark of floated western hemlock logs collected at pulping centers in the Pacific Northwest. A horn-angle hydraulic press was used to prepare the moist bark for extraction. Bark pressed in this manner required only 4 hr. for leaching, and the material did not pack or channel in the experimental leaching vat. It is believed that bark so prepared would probably leach well in continuous countercurrent-type equipment. Solubilization,

found necessary to reduce the high content of insolubles in the tannin extracts, was accomplished by the action of sodium bisulfite.

Chemistry of Western pines: Proximate analysis of ponderosa, Idaho white, and sugar pines, A. B. ANDERSON (*Indus. and Engin. Chem.*, 36 (1944), No. 7, pp. 662-663, *illus.* 1).—This article deals with the possible recovery and utilization of chemical products from three western pines. The newer methods of wood analysis, which were developed on other woods, are applicable to these important commercial woods. The extractives are not an integral part of the lumber, and since the pines are rich in this wood fraction, they offer an opportunity for economic recovery. This article is confined chiefly to the chemical characterization of the wood itself.

Production of 2,3-butylene glycol from wood hydrolyzates, D. PERLMAN. (Wis. Expt. Sta.). (*Indus. and Engin. Chem.*, 36 (1944), No. 9, pp. 803-804).—An investigation of the production of 2,3-butylene glycol from the sugar solutions produced by percolating dilute sulfuric acid (0.2-1.0 percent) through wood chips at temperatures in the neighborhood of 160° C. by fermentation with *Aerobacter aerogenes* showed that wood sugars so formed can be fermented completely in solutions having concentrations up to about 17 percent. About 35 percent of the sugar fermented was converted into 2,3-butylene glycol. A small proportion of acetoin was also produced, together with ethyl alcohol and lactic and succinic acids. The experimental fermentations were carried out upon hydrolyzates of white spruce, Douglas fir, red oak, and yellow pines. Acclimatization of the *A. aerogenes* culture to the hydrolyzate simplified the treatment of hydrolyzates for fermentation purposes.

Fodder yeast from wood sugar, W. H. PETERSON, J. F. SNELL, and W. C. FRAZIER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 37 (1945), No. 1, pp. 30-35).—About 150 fermentations of hydrolyzates from 13 species of wood with 9 types of yeast were run and the yields of yeast determined. Pretreatment of the hydrolyzate was necessary to ensure good yields. Processing with calcium hydroxide at pH 5, followed by addition of urea and phosphates, produced a suitable fermentation medium. *Torula utilis* No. 3, *Candida tropicalis*, and an unidentified yeast (P-13) were satisfactory organisms, but most of the fermentations were run with the *Torula sp.* Acclimatizing of the yeast to wood sugar increased the yield. Composition and pH of medium, size of inoculum, rate of aeration, and time of fermentation were other factors that affected the yield. Yields (calculated as dry yeast) of 35 to 40 percent of the total reducing sugar in the hydrolyzate were obtained regularly. About 90 percent of the apparent reducing sugar was fermented. The remaining 10 percent probably consisted of unfermented pentoses and nonsugar-reducing substances. Hydrolyzates from spruce and from southern yellow pine gave good fermentations, but those obtained from Douglas fir were very difficult to ferment. The wood sugar from maple, yellow birch, and beech gave results which were equal to those from the best softwoods.

Carotene concentrates from vegetable leaf wastes, M. E. WALL, E. G. KELLEY, and J. J. WILLAMAN. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 11, pp. 1057-1061, *illus.* 1).—The authors point out that certain vegetable leaf meals are rich sources of carotene, ranging in potency from 300 to 700 µg. per gram, and that petroleum ether solvents combine good solvent properties for carotene in leaf meals with relatively poor solvent properties for other plant pigments. A number of procedures for the preparation of carotene concentrates from vegetable leaf meals are described. Most of them are based on the rapid saponification of chlorophyll in petroleum ether solution, followed by adsorption treatment with hydrated lime. Upon removal of the solvent, deep red carotene concentrates equivalent to 20,000-200,000 International Units of vitamin A per gram were obtained.

The yield of purified carotene was from 85 to 95 percent of the carotene in the original extract.

Carotene content of alfalfa: Retention on dehydration and storage, R. E. SILKER, W. G. SCHRENK, and H. H. KING. (Kans. Expt. Sta.). (*Indus. and Engin. Chem.*, 36 (1944), No. 9, pp. 831-835, illus. 3).—Various treatments found to stabilize the carotene in alfalfa during the process of drying are reported. Blanching the fresh alfalfa with steam, prior to drying, furnished complete protection for the carotene, and considerable protection was afforded when fresh ground alfalfa was treated with certain chemicals before it was dried. Two types of chemicals were used—namely, antioxidants and substances which were known to inactivate enzymes. Diphenylamine and hydroquinone were the most effective of the first type and thiourea and sodium cyanide more effective than any other substances of the second type. The carotene content of alfalfa meal decreased as the temperature of storage was increased. Essentially no change in the carotene content of alfalfa meals stored at 3° C. was observed, however.

Carotenoids in corn distillers' by-products, W. BAUMGARTEN, J. C. BAUERNFEIND, and C. S. BORUFF (*Indus. and Engin. Chem.*, 36 (1944), No. 4, pp. 344-347, illus. 6).—Zeaxanthol, cryptoxanthol, their neo-forms, an unknown carotenoid, and several carotenes were found in corn distillers' byproducts. A partial loss in total carotenoid content during processing was observed, but these byproducts, as compared with yellow corn, were good sources of the carotenoid pigments. The carotenoid pigments both of the yellow corn and of its distillation byproducts were separated by chromatographic adsorption.

Acetylated casein fiber, A. E. BROWN, W. G. GORDON, E. C. GALL, and R. W. JACKSON. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 12, pp. 1171-1175).—Properties in which casein fiber, as ordinarily hardened by formaldehyde, is inferior to wool for textile purposes are noted. It is pointed out that, although there have been claims that acetylation improves some of the inferior properties of such protein fibers, quantitative data in support of these claims have not appeared.

Acetylation was carried out with acetic anhydride under various conditions, including the presence of catalysts. Acetyl contents from 1.0 to 9.0 percent were obtained by varying the time and temperature. Correlations between acetyl content and various properties are reported. Acetyl contents of about 6 percent could be introduced with no loss of wet or dry tensile strength. Fibers of such acetyl content were superior to the untreated control fiber in regard to resistance to boiling solutions simulating dye-bath conditions. They also had the desirable property of a greatly decreased affinity for acid dyes and thus more closely approximated wool in dye uptake.

Bacterial proteinase from waste asparagus butts, L. KLINE, L. R. MACDONNELL, and H. LINEWEAVER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 12, pp. 1152-1158, illus. 9).—The press juice from waste asparagus butts and trimmings is held to have potential value as a constituent of industrial microbiological media. In the production of bacterial proteinase, reproducible yields in asparagus juice media were obtained by controlling the pH and the concentrations of calcium, carbohydrate, nitrogen, and phosphate, and by exercising care with regard to culture technic. The culture filtrates, containing the proteolytic enzymes, were comparable with those obtained in commercial practice. It is suggested that proteinaceous press cakes from oil seeds and carbohydrates, major raw material for commercial media, may be largely replaced by asparagus-butt juice.

Protein-aldehyde plastics: Reaction of formaldehyde with deaminized casein, D. C. CARPENTER and F. E. LOVELACE. (N. Y. State Expt. Sta.). (*Indus. and Engin. Chem.*, 36 (1944), No. 7, pp. 680-682, illus. 1).—The combining ratios between

formaldehyde and deaminized casein were established over a concentration range up to 6.85 percent formaldehyde. The general law relating bound formaldehyde to total formaldehyde is shown to be the adsorption law, $X = KC^n$, over the concentration range investigated. The value of n is the same for deaminized casein as for acid casein previously investigated. The values for K were very different, only 45 percent as much aldehyde being bounded at any aldehyde concentration by deaminized casein as by acid casein. The aldehyde bounded by acid casein and deaminized casein agreed closely with that expected from the content of certain individual amino acids in the respective proteins.

Fire-cured tobaccos: Phenol, nicotine, and bacterial contents, J. NAGHSKI, E. G. BEINHART, and J. F. COUCH. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 6, pp. 556-559).—The method used for determining the total volatile phenols in tobaccos consisted in distilling the phenols with steam from the acidified samples, treating the distillate with the Folin phenol reagent, determining the light absorption at 7,000 Å., and comparing the distillate with a standard after correcting for nonphenolic volatile reducing substances. Dilute catechol solutions, treated as were the steam-distillates, were used as the comparison standards. The results obtained are regarded as reasonably accurate but not precise.

In the unfermented samples the number of bacteria per gram was correlated with the content of volatile phenols. This relation did not hold without exception in actively fermenting tobacco, where the conditions were more complicated. There appears to be no relation between the nicotine content and the bacterial count of the tobaccos studied. Micrococci were the predominating organisms on samples of fire-cured tobacco at the height of fermentation. In samples of tobacco fermented for snuff the micrococci increased initially but were supplanted by yeastlike forms as fermentation progressed. In samples of tobacco fermented for use in Italian-type cigars, the micrococci became and remained predominant. A few spore formers were detected at completion of fermentation when the total count became relatively low.

Ursolic acid and paraffin hydrocarbons from *Cryptostegia* leaves, J. W. WHITE, JR., and F. R. SENTI. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 5, pp. 881-882).—A fermentation pretreatment for rubber recovery from the leaves of *C. grandiflora* resulted in a leaf fraction consisting of all the epidermis, veins, and latex ducts, and representing about 18 percent of the original leaf weight. From this leaf fraction was isolated ursolic acid and a mixture of n -paraffin C_{20} , C_{21} , and C_{22} hydrocarbons.

The leaf fraction was exhaustively extracted with hot acetone. When the extract was cooled to room temperature a voluminous crystalline precipitate formed, representing 7.1-8.2 percent of the weight of the material extracted (1.3-1.5 percent of the weight of the original leaves). After one recrystallization this crude wax had an acid number of 49.0, a saponification number of 79.3, and a melting range of 222°-230°. Hydrolysis of this wax with alcoholic potassium hydroxide yielded an acid fraction (43 percent of the original wax) which was purified and identified as ursolic acid. The unsaponifiable fraction of the wax yielded the hydrocarbons above noted.

Vulcanization of saturated acrylic resins, W. C. MAST, C. E. REHBERG, T. J. DIETZ, and C. H. FISHER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 11, pp. 1022-1027, illus. 1).—Because of difficulty in the prevention of cross linkage during the polymerization of mixtures containing butadiene and other polyfunctional monomers, vulcanization of acrylic resins not having olefinic linkages was attempted. Polyethyl acrylate and various saturated polymers of ethyl acrylate were vulcanized satisfactorily with red lead and quinone dioxime and also with benzoyl peroxide. The copolymers made from acrylonitrile, cyanolthyl acrylate,

chloroethyl acrylate, chloropropyl acrylate, and phenyl acrylate were vulcanizable with certain sulfur-accelerator mixtures. The preparation of rubberlike materials by vulcanizing saturated acrylic resins instead of copolymers of the ethyl acrylate-butadiene type had the following advantages: (1) Agents and technics to prevent cross linkage were not required; (2) the polymers and copolymers were soluble, and hence the viscosity of the solutions could be used as an index of the molecular weight; and (3) synthetic rubber cements could be made.

Vulcanized acrylic resins: Copolymers of ethyl acrylate and allyl maleate, W. C. MAST, L. T. SMITH, and C. H. FISHER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 11, pp. 1027-1031, illus. 5).—Rubberlike materials were made by copolymerizing emulsified ethyl acrylate with small proportions of allyl maleate and vulcanizing the resulting unsaturated acrylic resins with sulfur and accelerators and with other agents in the absence of sulfur. Acrylonitrile (preferably about 6 percent) and dodecyl mercaptan had a beneficial effect, possibly because of their tendency to decrease cross linkage. Ammonium persulfate was preferable as a polymerization catalyst, and a small percentage caused polymerization to proceed smoothly. Benzoyl peroxide was also effective but produced such properties, as insolubility and toughness. Although not so active as benzoyl peroxide, hydrogen peroxide was moderately satisfactory. Sodium perborate had no advantage. Non-sulfur vulcanization gave promising results. Combinations of quinone dioxime, quinone dioxime dibenzoate, red lead, and lead peroxide produced vulcanizates with considerably higher tensile strength and somewhat greater hardness than were found in the sulfur vulcanizates.

Lactoprene, new synthetic rubber, C. H. FISHER, W. C. MAST, C. E. REHBERG, and L. T. SMITH. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 11, pp. 1032-1035).—Acrylic ester copolymers containing vulcanizable unsaturation were prepared by polymerizing methyl acrylate or ethyl acrylate with small quantities of polyfunctional monomers, such as butadiene, isoprene, and allyl maleate. Compounding the soft copolymers with sulfur and accelerators, followed by curing, produced rubbery vulcanizates. Several abundant carbohydrates could be converted, through lactic acid as an intermediate, into approximately an equal weight of vulcanized acrylic resins. Because of the key role played by lactic acid in this transformation, the name "Lactoprene" is proposed for synthetic rubber of this type.

Effect of solvents on sludge digestion, W. RUDOLFS. (N. J. Expt. Stas.). (*Indus. and Engin. Chem.*, 36 (1944), No. 8, pp. 742-743, illus. 3).—Laboratory experiments on the effects of solvents used in industrial processes showed that relatively small quantities influenced the rate and degree of sludge digestion. The various solvents had different effects on volatile-matter destruction and gas production. Small quantities of methyl, ethyl, butyl, and isoamyl alcohols produced greater volumes of gas but slightly retarded volatile-matter destruction. Ethyl ether stimulated gas production but had no effect on volatile-matter reduction. Acetone increased liquefaction of volatile matter without affecting gas production. Toluene and carbon tetrachloride, in smaller quantities, aided gas production but did not materially affect volatile matter destruction. Larger quantities retarded or inhibited digestion. Xylene was toxic to liquefying and gas-producing organisms. Ethylene dichloride was extremely toxic. Even 1 to 2 p. p. m. of ethylene dichloride in the sludge liquor retarded gasification, whereas 10 p. p. m. reduced gas production by more than 50 percent. Plant experience indicates that small batches of spent solvent cause fluctuation in gas production, and repeated discharges retard greatly or may inhibit the sludge-digestion processes.

Influence of nitrogen oxides on toxicity of ozone, R. D. WATSON. (Cornell Univ.). (*Indus. and Engin. Chem.*, 36 (1944), No. 6, pp. 559-561).—The authors record experiments indicating that ozone is the toxic agent in ozonized air, and

that there was no measurable difference in the toxicity to *Sclerotinia fructicola* and *Escherichia coli* of ozone produced from pure oxygen and from air when used at the same concentration. Nitrogen oxides had no direct effect on the toxicity of ozone. Of the possible nitrogen oxides that might be produced by ozonizing air, only nitrous oxide and nitrogen pentoxide could exist in the presence of ozone, and their additions to ozone had no influence on the toxicity of ozone to *S. fructicola* spores. Nitrogen pentoxide was produced by the ozonizers used, and an absence of the nitrous-acid-forming oxides nitrogen dioxide and nitrogen trioxide was demonstrated. It was found that nitrogen oxides may affect the acidity of the test medium, under which conditions there could be an indirect influence on the toxicity of ozone to fungi. The acidity of the medium had a relatively unimportant effect on the toxicity of ozone over the pH range 4.3 to 7.95, but below 4.3 there was an interaction between ozone and the acid in the medium which resulted in a large decrease in germination of the treated spores.

The surface tensions of calcium chloride solutions at 25° [C.] measured by their maximum bubble pressures, H. L. CUPPLES. (U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 67 (1945), No. 6, pp. 987-990, illus. 1).—The surface tensions of aqueous solutions of calcium chloride were accurately determined within the concentration range of from 0.203 to 7.301 moles of calcium chloride per 1,000 gm. of water (0.202 to 5.823 moles per liter of solution) by the method of maximum bubble pressure.

The observations are compared with those of several other investigators using the same and different methods of measurement. It is concluded that the divergence from the results of other investigators, amounting to a maximum of 0.76 dyne per centimeter at the highest concentration, may be due to errors of instrumentation, to slight errors in the published drop-weight correction factors when applied to aqueous solutions of high surface tension, or to a slight departure of the experimental conditions in the maximum-bubble-pressure method from the fundamental assumptions underlying the theory. The present measurements are in excellent agreement with published values obtained by the method of capillary rise.

Calcium metaphosphate: Effect of impurities on fusibility, citrate solubility, and hygroscopicity, G. L. FREAR, E. F. DEESE, and J. W. LEFFORGE (*Indus. and Engin. Chem.*, 36 (1944), No. 9, pp. 835-840, illus. 5).—Fertilizer-grade calcium metaphosphate, which is now produced in full-scale units at the Tennessee Valley Authority Fertilizer Works by reacting P_2O_5 with rock phosphate at high temperatures, has approximately the following percentage composition: P_2O_5 66.3, CaO 25.2, SiO_2 4.5, Al_2O_3 1.8, Fe_2O_3 2.1, and F 0.4. The product is vitreous unless it contains an excess of CaO, in which case it is partly crystalline, presumably as a result of the formation of some $Ca_2P_2O_7$. When the product carries an excess of P_2O_5 , it is somewhat hygroscopic, and in practice ground limestone is added to prevent caking. The authors report a laboratory study of changes in fusibility, citrate solubility, hygroscopicity, and the tendency of pure calcium metaphosphate to crystallize upon addition of phosphorus pentoxide, calcium oxide, silica, or the oxides of iron or aluminium.

A "reference" precipitated tricalcium phosphate hydrate: Preparation and identification, W. H. MACINTYRE, G. PALMER, and H. L. MARSHALL. (Tenn. Expt. Sta. et al.). (*Indus. and Engin. Chem.*, 37 (1945), No. 2, pp. 164-169, illus. 6).—Industrial and reagent preparations of calcium triphosphate having shown much variation in chemical, structural, and fertilizer properties, a process for the preparation of a tertiary precipitate of accordant composition and uniform properties as a reference material in chemical and biochemical research is proposed. The process prescribes the slow addition of concentrated H_3PO_4 to a chilled lime-saturated concentrated sucrose solution, prolonged agitation, filtration or centrifugation of the precipitate, and low-temperature drying. Chemical and X-ray examinations

demonstrated that the calcium content of the aqueous solution of sucrose occurred as the sucrate rather than the hydroxide. Accordance in composition and reproducibility of product were established by chemical and X-ray determinations. Differentiation between the reference tricalcium phosphate hydrate and hydroxyapatite was provided through two single chemical tests in comparisons of their 900° C. calcines.

Application of electronics to food processing (*New York State Sta. Rpt. 1945, pp. 24-25*).—Blanching of fruits and vegetables by the heat generated by currents induced in them by a high-frequency electric field was carried out by placing the washed materials in their final retail cartons, passing these through the high-frequency field to inactivate the enzymes, and then transferring the packages to the freezer. The loss of ascorbic acid was only 3 percent, as against 40-percent loss in boiling water blanching and 32-percent loss from steam blanching. Other possible applications of the high-frequency heating method in food processing are mentioned.

Preservation of fruits, berries, and vegetables by means of quick freezing (*New York State Sta. Rpt. 1945, p. 23*).—Variation in freezing time from almost instantaneous freezing to very slow did not produce detectable differences in quality as determined by experienced judges. The vitamin content was but slightly affected by the wide differences in freezing rates.

Nutritive value and quality of fruits and vegetables prepared by dehydration from the frozen state (*New York State Sta. Rpt. 1945, p. 24*).—In experiments on vaporization of ice from material held at -100° F., a new ice condenser was designed, tested, and shown to be very economical and efficient. Processing of samples of a number of varieties of vegetables and fruit juices by this method yielded products of excellent flavor, color, and rehydration properties. Many of the samples were found quite hygroscopic.

Correlation of several enzyme tests on blanched fruits and vegetables with their nutritive value and quality after processing and storage (*New York State Sta. Rpt. 1945, p. 23*).—The peroxidase reaction was not considered satisfactory. Some vegetables contain a substance which interferes with the reaction, and in general the demand for a negative peroxidase test results in considerable overblanching of the vegetable. Negative catalase or ascorbic acid oxidase tests were found to correlate best with the production of a most palatable and nutritious frozen product. The products included in this study were cabbage, carrots, asparagus, snap beans, corn, peas, soybeans, and apples.

Maple products investigations (*New York State Sta. Rpt. 1945, pp. 21-22*).—It is shown that zinc contamination of maple sirup is derived mainly from galvanized collecting buckets, though galvanized evaporators also contributed. Filtering the hot sirup through felt reduced the zinc content.

The characteristic brown color of maple sirup was found to be formed during the early stages of evaporation. Its production was found to be largely inhibited by the addition of 16 cc. of 0.1 N acid to the liter, and color formation was shown to be much increased by the addition of 35 cc. of 0.1 N alkali to the liter. In experiments in which the sap was refluxed at adjusted pH values, it was shown that the color formation requires the presence both of alkali and of invert sugar. Lowered storage temperature and the addition of sulfite decreased the rate of darkening during storage. Light had no effect.

Determination of the degree of hydrolysis of partial acid hydrolysates of casein and fibrin, D. V. FROST and J. HEINSEN (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 517-521).—Hydrolysates of casein and fibrin were prepared by hydrolyzing 20 percent solutions of the proteins for 2, 4, 5, 6, and 24 hr. in 2.8 N sulfuric acid.

Variations in the degree of hydrolysis were determined by the Van Slyke gasometric methods for free amino acid and total amino nitrogen (E. S. R., 26, p. 22).

The quantitative determination of thyroxine in iodinated casein having thyroïdal activity, E. P. REINEKE, C. W. TURNER, G. O. KOHLER, R. D. HOOVER, and M. B. BEEZLEY. (Mo. Expt. Sta. et al.). (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 599-611, illus. 2).—The authors describe a method based upon hydrolysis of the iodinated casein with 40 percent barium hydroxide solution, extraction of the thyroxine with *n*-butanol, and determination of the iodine content of the purified extract.

It was shown that thyroxine can be recovered quantitatively from known solutions by the extraction procedure. Hydrolysis of thyroxine with 40 percent barium hydroxide for 20 hr. results in destruction of 6 to 7 percent of the thyroxine taken. Diiodotyrosine was shown to have a negligible effect on the determination. There was excellent agreement between the thyroxine analysis of iodinated casein samples prepared under a variety of conditions and the biological assay value determined by the metabolic stimulation produced by the same preparations when injected intraperitoneally in guinea pigs. *n*-Butanol extracts of iodinated casein prepared exactly as for the chemical method produced a metabolic effect that was fully equivalent to their thyroxine content as chemically determined.

From these results it is concluded that any nonthyroxine iodine compounds passing through the chemical procedure with thyroxine either do not comprise more than a small fraction of the total iodine measured, or they must produce a metabolic response in guinea pigs comparable to that produced by thyroxine. Iodinated casein preparations that can now be formed contain from 3 to 4 percent of thyroxine, determined by either chemical analysis or biological assay.

The determination of creatine and creatinine, G. F. LAMBERT. (Univ. Ill.). (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 679-683).—The report that considerable quantities of creatinine are destroyed by the conditions used in the Folin method for the determination of creatine in the conversion of creatine to creatinine was not confirmed. Creatinine was destroyed only to a slight extent when it was autoclaved with picric acid but to a considerable extent when autoclaved without picric acid. Either the boiling or autoclave method of Folin produced a 97 to 98 percent conversion of creatine to creatinine. For the autoclave procedure the optimum conversion occurred in 80 min. at 121° [C.]. Time factors were altered slightly to adapt the method to the use of the Evelyn photoelectric colorimeter.

Interference in the determination of thiamine with diazotized *p*-aminoacetophenone reagent, R. R. SEALOCK and R. L. GOODLAND (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 63-68, illus. 1).—The assay of thiamine by the colorimetric method of Melnick and Field (E. S. R., 83, p. 11) is influenced by a number of substances. The presence of heavy metal salts, potassium ferricyanide, hydroxylamine, hydrogen sulfide, cysteine, iodine, or sodium sulfite markedly influence the reaction of thiamine with the diazotized *p*-aminoacetophenone reagent. Experiments with mercuric chloride, sodium sulfite, and cysteine indicate that the extent of the inhibition is a function of the concentration of the compound used.

"The possibility of theoretical and practical implications of relationships of this type is illustrated with the results of thiamine assays which show the deleterious effect of cocoa on the thiamine values obtained by both the Melnick and Field and fermentation methods. Evidence of the interference of ascorbic acid in the fermentation method is also presented."

Photometric determination of potassium in biological materials, R. SALOMÉ PEREIRA (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 617-629).—The author describes a modification of the silver cobaltinitrite method, adapted for use with from 0.05

to 0.2 cc. of blood serum. The potassium was isolated as the potassium silver cobaltinitrite and its quantity calculated from that of the cobalt, which was determined photometrically by means of the color developed upon adding dimethyl glyoxime and benzidine. The color system thus formed was found to follow the Lambert-Beer law.

The potassium content of 0.05 to 0.2 cc. of solutions containing 15 to 40 mg. per 100 cc. was estimated by the photometric determination of cobalt in the potassium silver cobaltinitrite precipitate with an error inferior to 3 percent. A simple, reliable method of ashing the sample is described, and analyses for blood serum from different animals are given. Good recovery of potassium added to the sera used was obtained.

A method for the determination of copper in blood serum, G. E. CARTWRIGHT, P. J. JONES, and M. M. WINTROBE (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 593-600, illus. 3).—The authors present evidence indicating that approximately 75 percent of the copper contained in serum is present in the filtrates prepared by precipitation of the serum with trichloroacetic acid. Three warm extractions of the trichloroacetic acid precipitate were shown to remove approximately 97 percent of the copper. A method for the determination of copper in serum or plasma was based on a triple warm extraction of a trichloroacetic acid precipitate followed by the colorimetric determination of copper with sodium diethyldithiocarbamate. The colored solutions were read in the Evelyn photoelectric colorimeter.

Classification of tobacco: Nicotine-nornicotine method, C. V. BOWEN and W. F. BARTHEL (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 5, pp. 475-477, illus. 2).—The melting points of the picrates of known mixtures of nicotine and nornicotine indicated that the melting point of the steam-volatile alkaloid picrate could be used as a means of classifying tobaccos as to alkaloidal type. According to the upper limit of the melting point spread, the tobacco was classified as of the nicotine type (melting point above 211° C.), mixed nicotine-nornicotine type (melting point 198°-211°), or nornicotine type (melting point below 198°). Six tobaccos of known nicotine and nornicotine content were tested for melting point of mixed picrates, and they were found to agree with the classification.

A comparison of various modifications of the Babcock test for the testing of homogenized milk, G. M. TROUT and P. S. LUCAS. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 28 (1945), No. 12, pp. 901-919, illus. 2).—Five series each of lower-fat and higher-fat homogenized milk were tested by each of ten modified methods as well as by the Mojonnier and by the regular Babcock method. No one test was found consistently and completely to eliminate the foreign material at the base of the fat column of tests on homogenized milk, although some test reduced the amount of this material to a negligible quantity. The modified methods, yielding results both on lower-fat and on higher-fat homogenized milk closer to those of the Mojonnier and to those of the regular Babcock test on nonhomogenized milk, had in common (1) the use of the approximate or full amount of normal strength acid required of the Babcock test; (2) the addition of the acid in at least three portions; and (3) the remixing of the acid-serum-water mixture after centrifuging and following the addition of water. Clear, char-free fat columns were obtained by the addition of a water-alcohol mixture (1.4 to 1) to the test instead of the final addition of water. It appeared that in making a good Babcock fat test of homogenized milk, the reaction of the sulfuric acid on the proteins of the milk, particularly on that adsorbed to the fat globules, must be prolonged and must be as vigorous as possible without heating the sample enough to char it.

A colorimetric determination of blood acetoin, W. W. WESTERFIELD (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 495-502, illus. 1).—To 5 cc. of solution containing between 1γ and 12γ of acetoin or biacetyl are added consecutively 1 cc. of 0.5 percent creatine and 1 cc. of the 5 percent α-naphthol solution. The latter reagent should not

be prepared until after the creatine has been added to the test solution, and it is used as soon as the α -naphthol dissolves. The color is allowed to develop at room temperature for exactly 10 min. when biacetyl is being determined, and 1 hr. for the determination of acetoin. The relative intensity of the color is then determined by means of a photoelectric with "540" color filter. A reagent blank, prepared simultaneously with the sample, was used to adjust the galvanometer of the instrument to a reading of 100. Reproducible, through somewhat unstable, colors were obtained, biacetyl and acetoin giving very similar absorption spectra, the maxima occurring at 530 m μ . Both curves were relatively flat between 520 and 540 m μ . Advantages of the method were found to be its simplicity and a sensitivity superior to that of previous methods of this type. A procedure for oxidizing acetoin to biacetyl by means of ferric chloride in acid solution provides for the determination of acetoin in the presence of substances interfering with its direct estimation, the biacetyl being distilled out and determined as above.

The determination of catechol, phenol, and hydroquinone in urine, H. D. BAERNSTEIN (*Jour. Biol. Chem.*, 161 (1945), No. 2, pp. 685-692, illus. 2).—A system of analysis of urine for catechol, phenol, and hydroquinone has been described. The extraction of phenols from urine has been improved by the use of a sodium sulfite buffer which kept diphenols reduced and held back ether-soluble acids. The precipitation of lead catecholate from the ether extract was controlled at pH 6.5 by the use of pyridine-acetate buffer, and the separation of the lead as iodate instead of the usual chromate yielded more iodine per atom of lead. It was found that phenol could be brominated in the presence of hydroquinone provided sufficient acid was present. A new oxidation of hydroquinone in which 10 atoms of iodine per mole were reduced, resulting in the formation of a tripyridinium quinone betaine, was found advantageous. The methods "are simple and fairly specific when the separations are successful." They were applied to the analysis of rabbit urine during exposure to benzene, and a typical set of curves is given.

The estimation of free formaldehyde by diffusion, M. J. BOYD and M. A. LOGAN (*Jour. Biol. Chem.*, 160 (1945), No. 2, pp. 571-583, illus. 6).—A procedure for the estimation of free formaldehyde in solutions was based upon diffusion of the formaldehyde vapor from the solution into a membrane, either of a cellulosic sausage-casing material or of nitrocellulose deposited by evaporation of its solution in alcohol and ether, the film having been treated with a solution supplying phenylhydrazine hydrochloride sufficient to react with the aldehyde or prepared from a solution containing this reagent. Treatment with ferricyanide and acid developed a red color in the membrane which had reacted with the aldehyde, and this was compared with colors similarly produced from standard formaldehyde solutions. The procedure was found useful for the control of formaldehyde concentration during detoxication of bacterial filtrates.

The effect of the pH value upon the diffusion of formaldehyde from its solutions was investigated, as was also the reaction of formaldehyde with amino acids at various pH values. Amino acids with hydrosulphyl or hydroxyl groups in the position were found to combine immediately with formaldehyde to an extent greater than that observed in the absence of such substitution.

AGRICULTURAL METEOROLOGY

Algunas investigaciones sobre circulacion atmosferica [Some investigations of atmospheric circulation], E. L. DIAZ (*An. Soc. Cient. Argentina*, 137 (1944), No. 6, pp. 241-272, illus. 8; *Eng. abs.*, pp. 241-242).—This study concerns the determination of the direct solar radiation influences; evolution of the meteorological variables preceding the polar air movements in Argentina; the generation and symptoms of the south polar cyclones, corresponding actions on middle South America, and over-

flow of polar air masses; the thermal depressions of central Argentina as a symptom of the genesis of a polar cyclone in the southern Pacific; and the generation of dynamic cyclones in northern Argentina.

The primary and secondary scattering of sunlight in a plane-stratified atmosphere of uniform composition.—II, Numerical tables and discussion of the directional distribution of the primary scattered light, A. HAMMAD (*Phil. Mag.*, 7. ser., 36 (1945), No. 257, pp. 434-440, illus. 1).

Preliminary note on condensation in the form of clouds and dew, J. W. ARCHBOLD (*Phil. Mag. and Jour. Sci.*, 7. ser., 34 (1943), No. 236, pp. 632-642, illus. 10).—In considering the process of condensation by cloud formation, it would be expected on the basis of the classical investigations by Kelvin and Thomson that large drops would grow at the expense of small ones. It is therefore important to assess the distribution of drops according to size and so as to exhibit the competition for growth among the drops. "This paper represents a preliminary effort to do so."

Second note on condensation in the form of clouds and dew, J. W. ARCHBOLD (*Phil. Mag.*, 7. ser., 36 (1945), No. 257, pp. 414-418, illus. 1).—A continuation of the preceding, with certain minor corrections.

An approach to quantitative forecasting of precipitation.—II, Formulas for quantitative rainfall forecasting, A. K. SHOWALTER (*Amer. Met. Soc. Bul.*, 25 (1944), No. 7, pp. 276-288, illus. 2).—In this contribution of the series (E. S. R., 92, p. 12), the computation of rainfall is said to be most readily accomplished by use of moisture-flow equations which assume precipitation to be the residual or difference between inflow and outflow. The approach is to determine the boundary conditions around a general rain area and then to convert the indicated excess flow of moisture into the observed average depth of rainfall. Fundamental to such a procedure is the requirement that the outflow column or layer be saturated and that all moisture in excess of that requirement be condensed and immediately precipitated over the same general area where the moist air is lifted. Best results have hitherto been attained for areas greater than 5,000 sq. miles, and it is doubted that the method is properly applicable to areas of less than 1,000 sq. miles. Quantitative rainfall computations are not believed feasible for small areas. The subject is discussed as regards moisture content, precipitable water, relation to dew point, effective precipitable water, and comparison of rainfall computation methods. Formulas are presented and recapitulated, and their use in forecasting is considered.

Hurricanes of Texas, G. W. SCHLESSELMAN. (Tex. A. and M. Col.). (*Tex. Acad. Sci. Proc. and Trans.*, 28 (1944), pp. 173-182, illus. 4).—A general discussion, with annotated listing of major hurricanes on the Texas coast, 1818 to 1944.

Dust-storms in Egypt and their relation to the war period, as noted in Maryut, 1939-45, F. W. OLIVER (*Geog. Jour.*, 106 (1945), No. 1-2, pp. 26-49, illus. 8).

Monthly Weather Review [April-September 1945] (*Mo. Weather Rev.* [U. S.], 73 (1945), Nos. 4, pp. 61-79, illus. 10; 5, pp. 81-96, illus. 10; 6, pp. 97-114, illus. 10; 7, pp. 115-131, illus. 10; 8, pp. 133-150, illus. 10; 9, pp. 151-166, illus. 10).—These issues contain meteorological, climatological, solar radiation, and sunspot data.

SOILS—FERTILIZERS

The "Catena-Drainage Profile" key-form as a frame of reference in soil classification, T. M. BUSHNELL. (Ind. Expt. Sta.). (*Soil Sci. Amer. Proc.*, 9 (1944), pp. 219-222).—"The main point in this paper is a suggestion that detailed 'keys' for soils of different regions, each with limited range in climatic conditions, might be combined without essential changes, especially in catena groupings, into a 'classification' embracing all soils of the world."

Certain ideas and terminology presented by the author in a previous paper (E. S. R., 91, p. 644) constitute a background essential to the development here presented.

A quantitative approach to the study of the thermal characteristics of clays, C. D. JEFFRIES. (Pa. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 86-91, illus. 9).—The author presents some preliminary results of a study of clays by the method of differential thermal analysis, involving the determination of heating curves for various clays and particularly for mixtures of kaolin with Al_2O_3 , quartz, and halloysite in which the weights of the sample and standard compared are determined by their average specific heats. It was found that the difference in temperature between the standard and the clay at the maximum endothermic reaction had quantitative significance. It was necessary to determine the specific heats of a variety of clays, and the results show that clays in general vary widely in this property, so much so that neglecting this factor in differential thermal analysis may lead to erroneous conclusions in many cases, and particularly when quantitative data are desired.

The weights of the clay and of the standard material heated with it being based upon their respective specific heats, quantitative data could be obtained from the heating curves determined in differential thermal analyses of clays. Any reactions occurring during the heating could then be compared, the specific heat of the standard at the temperature of occurrence of the change being used as a basis for the calculation.

It cannot be assumed that all clay species will give the same results, i. e., that all kaolins will show an endothermic reaction corresponding to 26.96 percent increase in apparent specific heat of clay over standard. This method, however, does offer possibilities to determine the relationship of $SiO_2: Al_2O_3$ ratios in kaolins and thermal properties. One of the reasons for this study was to determine the effect of exchange reactions on thermal properties of soil clays, i. e., comparing the thermal properties of clays after treatment with various cations.

Clay formation and movement in two claypan soils, the Putnam and Cowden, E. P. WHITESIDE (Mo. and Ill. Expt. Stas.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 211-218, illus. 1).—Profiles of two soil types of the Planosol great soil group, geographically situated in northeastern Missouri and southwestern Illinois, were characterized by a laboratory study of their color, mechanical analyses, volume weights, total carbon, base exchange capacities, total exchangeable bases, and exchangeable sodium. Results of these studies, when compared with the published and unpublished analyses of these soils, showed that the profiles selected for study were representative of Putnam and Cowden silt loams.

The chief differences found between the two soils were a higher clay, base exchange capacity, and carbon content of the Putnam silt loam, particularly in the claypan horizon, which is a prominent feature of both soils. These soils were developed from shallow loess deposits overlying glacial drift, and a mixture of these two deposits was shown to have occurred throughout the Cowden profile and, to a lesser extent, in the lower portion of the Putnam soil. An examination of the soil formation factors for the most likely explanation of the difference in total clay content of these soils indicated that parent material was probably the dominant factor involved. Calculations, based on certain assumptions, indicated that at least a considerable part of the high clay content of the claypan horizons was due to the movement of clay within the soil profile in addition to that formed in place. Some movement of each clay fraction less than 2μ in equivalent diameter is indicated, but a larger proportion occurred in the finest clay fractions and the smallest proportion in the coarsest clay fraction. The full extent of this movement could not be determined without a complete mineralogical analysis of the samples. The calculations give only minimum values.

The effect of montmorillonitic and kaolinitic clays on the formation of platy structures, J. B. PETERSON. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 37-48, illus. 7).—Laboratory experiments with synthetically formed soil

aggregates and study of the mineral contents of profiles of field soils showed that kaolinite is associated with the formation of platy soil structure. It is considered possible, however, that materials other than those tested may take part in the production of platy structure in field soils. The data obtained indicated that platy structure may be expected to develop within comparatively shallow depths of the profile, in layers containing kaolinite without an abundance of montmorillonite, in the absence of appreciable amounts of humus, calcium, and iron oxides, and in a zone free of extensive root activity such as would be found under a native prairie sod. It was concluded that the anisotropic platy structure resulting from kaolinite and the isotropic structural pattern produced by montmorillonite may be explained by the differences in size and shape of the primary particles of the two clays. These structures may also be explained as resulting from a more uniform charge over the surface of montmorillonite compared with the concentration of charge on the broken edges of the plates of kaolinite. H-saturated kaolinite produced more definite platiness than did Ca-saturated montmorillonite.

The dominating influence of montmorillonite on structure in mixtures containing both montmorillonite and kaolinite may be explained by the higher surface, greater hydration, and higher charge of the montmorillonite. Structure was found not to develop in kaolinite unless this mineral was diluted slightly either with montmorillonite or with sand; and it is pointed out that some soil layers and natural clay deposits containing much kaolinite are known to be very compact. These phenomena, it is believed, may result from the low hydration of the kaolinite and from its small swelling. In general, the Podzol soils showed a higher proportion of kaolinite in the A horizon and a higher proportion of montmorillonite in the B horizon. The oldest soils of the Iowa group and the oldest of a series of three from California were higher in kaolinite than were related younger soils.

Aggregation studies of Houston clay in Mississippi, R. WOODBURN. (Miss. Expt. Sta. and U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 30-36, illus. 4).—The effects on aggregation of (1) clod size in sample, (2) amount of prerun shaking, and (3) air- v. oven-drying were investigated. It was found that a decrease in size of clods of air-dried materials resulted in decrease in the percentage of large aggregates. Increased amounts of prerun shaking decreased amounts of large aggregates. Slaking was more complete following oven-drying than air-drying. It was concluded that clod size was not important where oven-drying was used. Five-min. prerun shaking and oven-drying are recommended. It was found that oven-drying and wetting changed Houston clay subsoil and also Susquehanna clay from a dense, compact structure to fragments, or aggregates. It was concluded that aggregate analysis for Houston clay or similar soils cannot present a true picture of the structure of the undisturbed compact soil in place. Aggregate size distribution was sharply affected for several cycles of drying-wetting as the larger aggregates broke into smaller ones. The aggregates 0.21 to 0.020 mm. were very stable, especially in the Houston clay. Summer exposure of Houston clay subsoil to several cycles of drying and wetting by sun and rain caused extensive fragmentation or aggregate development. After mechanical dispersal in the laboratory to simulate dispersal or puddling by machinery action, Houston clay was found to slake again into fragments or water-stable aggregates when oven-dried and wet. Repeated cycles of freezing and thawing of Houston clay subsoil material affected aggregate size distribution, but not as much as did drying and wetting.

Effect of waste sulfite liquor on aggregation of soil particles, R. B. ALDERFER, M. F. GRIBBINS, and D. E. HALEY. (U. S. D. A., Pa. Expt. Sta., et al.). (*Indus. and Engin. Chem.*, 36 (1944), No. 3, pp. 272-274).—On freshly plowed soils (Hagerstown series), enough of the concentrated preparation, chemically treated to remove deleterious components, and containing 50 percent of total solids, to supply 5 tons

to the acre was applied in diluted form; and the soils, cultivated after becoming thoroughly dry, were planted to tobacco. A marked improvement in soil particle aggregation was obtained, and was "apparent long after the crop was harvested."

Treatment of these soils with 1,000 lb. of 3-6-12 fertilizer to the acre did not supply nitrogen sufficient to prevent some nitrogen-deficiency symptoms as the crop approached maturity, however. In the greenhouse, fertilizer being supplied at the rate of 1,500 lb. to the acre, a good yield of tobacco seedlings was obtained after the application of the sulfite liquor in a quantity amounting to 2.5 tons of total solids to the acre. The use of 5 tons total solids to the acre interfered with germination, mainly because of a lack of aeration due to temporary cementation of the upper soil layer by undecomposed material. After 8 weeks, the soils of the greenhouse experiment showed a marked particular aggregation.

Similar experiments and results with soils treated with both fertilizer and manure in addition to the sulfite liquor preparation are recorded. It was concluded that an excellent soil structure can be obtained by the proper use of such a preparation. It is noted, however, that "if this material is to be used as a soil amendment, the quantity to apply must be watched carefully, and intimate mixing with the soil particles must be insured. A few weeks at least should elapse before crops are seeded on soil so treated, in order to provide a suitable interval for soil organisms to decay the less resistant materials. To insure more rapid and thorough decomposition of these materials, the addition of an ample quantity of a well balanced fertilizer mixture should precede the treatment. This mixture should carry from 40 to 60 lb. per acre of readily available nitrogen when the equivalent of 5 tons of dissolved solids are used."

Characteristics of Iowa peat profiles, J. B. PETERSON. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 126-130, *illus.* 1).—Measurements of the lignin content of the organic fraction, the amount of ash, carbon : nitrogen ratio, and pH were made on several peat profiles found to be typical of large areas of peat in Iowa. Similar measurements of surface soils of bogs recently reclaimed in comparison with those long cultivated were made. Qualitative characteristics of the Iowa peat bogs (mostly of the sedge type, and occurring in the northern part of the State, in the Wisconsin glaciation area) are recorded in some detail. The reclaimed areas of these peat bogs are largely farmed in a regular upland rotation in conjunction with the Webster soils, with which they are usually associated.

The chemical examination showed that most of the profiles were slightly acid, except for the shell-bearing layer just above the clay which was always neutral or alkaline. A few profiles were alkaline throughout, and a few ranged in acidity around a pH of 5. The ash content of the profiles was variable and not related to pH, lignin content of the organic matter, or carbon-nitrogen ratio. The lignin content of the organic matter in the peat profiles was variable, but it increased markedly in the black layers immediately overlying the clay substratum. The author expresses the opinion that the high lignin content of the organic fraction in these layers may be due to (1) a different type of parent material, (2) older age and slower deposition with more time for decomposition, (3) possible anaerobic environment of the deposit when covered by water, and (4) movement and deposition of lignin-rich material or of material preferentially inhibiting decomposition of lignin.

A study of the shrinking and swelling properties of Rendzina soils, J. R. JOHNSTON and H. O. HILL. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 24-29, *illus.* 10).—A procedure for determining the volume of natural soil clods at different moisture levels is described. Curves representing some of the data obtained show the relation between volume and moisture content of the surface and subsoil of Austin clay and Houston Black clay soils. The effect of dry-weather cracks on soil moisture content is discussed and illustrated graphically. Surface

patterns of dry-weather cracks under different crops, the vertical character of these cracks, and the effect of wetting and drying on the formation of a granular soil structure are discussed and illustrated photographically.

It is concluded that dry-weather cracks in Houston and Austin soils were caused by a soil shrinkage, due, in turn, to a drying out of the soil. For Austin clay the greatest shrinkage occurred in the middle half of the soil-moisture range. For Houston Black clay the greatest shrinkage occurred in the upper three-fourths of the soil-moisture range, with a slightly less rate of shrinkage in the upper one-fourth. Dry-weather cracks, once formed, speeded up the rate of soil moisture loss by evaporation. Solid vegetative cover and fallow caused a "mud crack" pattern of dry-weather cracks. Cotton or corn in rows caused a large continuous crack in the row middle, with other cracks meeting it at approximate right angles. Wetting and drying were necessary for the formation of a granular structure and a good seedbed on these soils.

The effect of freezing-thawing and wetting-drying cycles on the density and bearing power of five soils, H. F. WINTERKORN and R. G. FEHRMAN (*Soil Sci. Soc. Amer. Proc.*, 2 (1944), pp. 248-252, illus. 1).—In compaction tests, the densities and bearing values obtained by standardized methods were found to depend upon the texture, structure, and moisture content of the soils. Water exposure and cycle tests showed that after 4 days' immersion in water the bearing values of the soils were from 3 to 11 percent lower than were those found at maximum density and optimum moisture content in soils which had not been immersed. Twelve freezing-thawing cycles lowered the bearing values of the clay soils by from 1 to 5 percent. A Nimitz fine sand failed under this treatment, however. A like freezing-thawing treatment followed by 12 days' water immersion had generally an effect upon bearing values somewhat greater than that to be expected from their final moisture contents. Twelve cycles of wetting and drying reduced the bearing value of all the soils almost to zero. Twelve cycles of freezing and wetting reduced the bearing value of all soils practically to zero.

The bearing of these results upon the problem of the maintenance of design properties of soils is discussed.

Factors affecting the percolation of water through a layer of loessial soil, T. M. MCCALLA. (U. S. D. A. coop. Nebr. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 12-16, illus. 1).—Conditions for making determinations of the percolation rate in loessial soils are discussed. Compacting, puddling, reducing aggregate or lump size, and sprinkling all decreased the percolation rate. The percolation rate was varied to a considerable extent by changing the mechanical state of the soil. When soil was left in a lumpy condition there was an increase in water intake. Finely pulverized soil had a low percolation rate regardless of whether it had organic matter or not. Disturbed samples of the Peorian loess had a higher percolation rate than the undisturbed samples. The percolation rate of the Peorian loess irrigated or sprinkled was low. The surface soil had a high percolation rate when water was applied by irrigation. The organic matter present in the surface soil increased the percolation rate over the Peorian loess without organic matter under most experimental conditions varying from 5 to 100 times. However, when some of the aggregates were broken down by puddling, the presence of organic matter did not increase the percolation rate.

Moisture and energy conditions during downward entry of water into moist and layered soils, E. A. COLMAN and G. B. BODMAN (U. S. D. A. and Univ. Calif.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 3-11, illus. 9).—In an investigation of soil moisture and energy conditions obtaining during the passage of water into moist columns and into texturally layered columns of laboratory-packed soils, the authors found that the decreased rate at which the water entered the soil column as a result of moistening the soil prior to the infiltration experiment appeared due to the

decreased pressure potential gradient against the wet front. A reduction of infiltration rate due to displacement of the soil solution by infiltrating water seemed also to be possible, since this water aids in the dispersion of the soil clays.

In texturally layered columns the less permeable layer limited water entry into the soil surface regardless of whether it lay above or below the more permeable one. If the less permeable layer occupied the upper position, the water entry characteristics of the column were very much like those of a uniform column of the same soil. If this layer occupied the lower position, a positive hydrostatic pressure developed in the layer above. This pressure increased with time but showed no influence upon the rate of water entry into the lower layer. It is pointed out that, if this sequence of layers occurred in a sloping field soil, lateral subsurface flow would take place within the upper layer when the rainfall rate exceeded the infiltration rate of the lower, less permeable layer.

This study is held to have demonstrated that the infiltration principles noted in initially dry soil columns of uniform texture are applicable in interpreting the infiltration process in the dry, nonuniform soil columns and the moist columns of uniform textures studied.

An automatic aliquot runoff sampler, H. KOHNKE and R. B. HICKOK (Ind. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 8 (1943), pp. 444-447, illus. 3).—The sampler described was developed for the collection of representative portions of the runoff from small watersheds (1.6 to 3.8 acres).

A plate providing a vertical series of circular holes is set into the side wall of a water-measuring flume to conduct 1 percent of the flow into a collector manifold. One-ninth of this water is directed into a tank. Theoretically, the sample thus obtained contains the constituents of the runoff water in concentrations corresponding to their weighted averages throughout any period of runoff. Although clogging of the sampling openings may happen occasionally if the runoff contains considerable amounts of trash, the performance was generally satisfactory under the conditions encountered at Lafayette, Ind. Both the soil content and the concentration of available nutrients in the runoff must be determined to evaluate erosion losses. Methods of analysis for total solids, organic matter, nitrogen, available phosphate, and bases were modifications of the corresponding analyses of soil.

Comparative effects of plowing and other methods of seedbed preparation on nutrient element deficiencies in corn, C. A. BOWER, G. M. BROWNING, and R. A. NORKON. (Iowa Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 142-146, illus. 2).—As indicated by the symptoms and nitrogen content of the plant and the soil content of nitrate nitrogen, the method of seedbed preparation had a marked effect on nitrogen deficiency in corn grown on Tama soil. Where no fertilizer was applied there was little evidence of nitrogen deficiency in corn on plowed soil, whereas on listed, disked, and subsurface-tilled soil nitrogen deficiency was quite marked, especially under the latter two treatments. Corn yields on the variously tilled soil where no fertilizer was applied were directly related to the data obtained on nitrogen deficiency, the yield of plowed corn being 18 bu. per acre higher than the average of yields obtained where the soil was tilled by the other three methods. Fertilizer containing nitrogen increased yields under all tillage methods except plowing. Under the last-named treatment, there was no nitrogen deficiency.

On Fayette soil it was found by determinations of plant potassium content and by plant symptoms that corn on plowed soil was much less potassium-deficient than that on listed, disked, or subsurface-tilled soil. Where no fertilizer was applied, the corn yield on plowed soil was 18 bu. per acre higher than the average of the yields obtained with the other three tillage methods. Fertilizer increased the yield significantly only on listed and subsurface-tilled soil. Results obtained on Webster and Clarion soils in a comparison of the effects of plowing and subsurface tillage on potassium deficiency were similar to those obtained on Fayette soil.

The effect of cropping on the organic matter, nitrogen, phosphorus, and potassium in the profiles of peat soils, E. V. STAKER and F. M. JORNLIN. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 117-125, illus. 1).—The authors report upon an investigation of the effect of cropping on certain constituents in the layers of 24 peat-soil profiles in New York. A part of the profiles studied was from virgin areas and the remainder from adjacent cultivated land. All profiles were sampled on a morphological basis rather than at arbitrary depths. Data covering analyses for organic matter, total nitrogen, phosphorous, potassium, and easily soluble phosphorus and potassium are presented. No significant loss of organic matter was found for the surface layers of the cultivated soils from Wayne and Genesee counties. Those from Madison, Oswego, and Orange counties showed a consistent loss with increase in the years of cultivation. A slight loss in total nitrogen was noted in the plowed layers of some profiles, but those from Orange County indicated a decided gain with increased period of cropping.

More total phosphorus was found in the surface layers of both virgin and cropped areas than in the layers beneath. This difference was very marked with some profiles. The concentration of phosphorus increased with cropping up to about 20 yr. In the profiles from Wayne and Orange counties that had been cultivated for 60 and 74 yr., respectively, no more residual phosphorus was found in the cultivated layer than in those that were cropped for much shorter periods. Layers immediately beneath the surface were not influenced by the application of phosphorus to the surface soil over a period of years.

More total potassium was found in the surface layers than in the layers immediately below. The relationship between years of cropping and concentration of potassium in the plowed soil was not a consistent one for the Wayne County group of profiles, but was for those from other areas. The amount of potassium decreased with depth, followed in some profiles by a sharp increase in the lowest layer sampled.

Study of the easily soluble phosphorus and potassium was limited to one group of profiles. Only a small percentage of the total phosphorus and only a relatively small amount of the total potassium was found to be soluble in normal ammonium acetate of pH 5.0. The solubility of both elements in the surface layers increased with time of cultivation but was less for the 60-yr. profile than for the 20-yr. profile. The data obtained by the use of rapid chemical tests agreed well relatively with that obtained by leaching with ammonium acetate.

Loss of nitrogen from flooded soil as affected by changes in temperature and reaction, W. H. WILLIS and M. B. STURGIS. (La. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 106-113).—In a study of nitrogen losses under conditions simulating those occurring in rice fields, much ammonia nitrogen was found to be lost from soils of high nitrogen content at 100° F., a loss which was increased by flooding and by a decrease in H-ion concentration. In the flooding of soils of low nitrogen content at temperatures of from 80° to 85°, comparatively small ammonia-nitrogen losses were observed. It was found that large losses of ammonia may occur from an acid soil containing much organic matter when ammonia is being liberated by decomposition, but in a soil low in organic matter and with a high exchange capacity a considerable amount of ammonium nitrogen may be held at relatively high temperatures and at reactions near or even slightly above neutrality. Nitrogen was lost from all the soils under flooded conditions, the larger losses occurring from soil high in nitrogen or where large additions of nitrogen had been made. Ammonium nitrogen diffused out of the soil into the floodwater and the pH of the floodwater increased with time. Within 4 to 7 weeks, the change toward alkalinity of the floodwater, together with high temperatures, 85° to 107°, reduced the content of ammonium nitrogen in the floodwater. With an acid soil low in nitrogen which was flooded, had different treatments, and was held at temperatures varying from 85° to 107°, the soil-water system lost quantities of nitrogen varying from 1:1 to 53 p. p. m.

The greatest loss occurred where organic nitrogen and lime were added. Ammonium nitrogen added to buffered floodwater disappeared quickly at reactions above pH 6.7 at temperatures of 85° to 107°. Determinations of total nitrogen losses from the soil-water system indicate that the ammonium nitrogen disappearing from the floodwater was not adsorbed by the soil.

Preparation of ammonium nitrate for fertilizer use, W. H. ROSS, J. R. ADAMS, J. Y. YEE, and C. W. WHITTAKER. (U. S. D. A.). (*Indus. and Engin. Chem.*, 36 (1944), No. 12, pp. 1088-1095, illus. 4).—Laboratory and large-scale storage experiments on the properties of this salt indicated that ammonium nitrate can be produced and stored in a satisfactory form for direct use as a fertilizer by granulating the product to give particles in the neighborhood of 8-16 mesh, drying to a moisture content of 0.2 percent or less, treating with 3-4 percent of a suitable conditioning agent, and storing in bags that are sufficiently moisture-proof to keep the material dry throughout the period of storage. Bags that will comply with this specification are now available at a relatively low cost.

Nitrogen and phosphate fertilizer levels in relation to potato yields and to soil constituents during dry seasons, R. L. CAROLUS and W. G. WOLTZ. (Va. Truck Expt Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 194-199).—To determine effects of fertilizers under drought conditions, 54 mixtures were applied in an experiment laid out factorially. Due to the frequent recurrence of droughts during the spring growing season, in many sections of Virginia, a study was made of the influences of 54 fertilizer mixtures on potato yields during four consecutive dry years. The experiment, laid out factorially and involving comparisons of the effect of three levels each of nitrogen, phosphate, and potash and two levels of calcium on yield and soil and plant composition, was conducted on a Sassafras sandy loam soil of below average productivity.

The highest average yields of potatoes were obtained from plots treated with mixtures containing nitrogen applied at the rate of 60 lb. to the acre and phosphate applied at the rate of 240 lb. to the acre. Plots treated with nitrogen at higher rates produced significantly lower yields. Plants from plots receiving nitrogen at rates higher than 60 lb. to the acre contained excessively high quantities of soluble nitrogen and the soil from the plots was more acid than soil from plots that had received a smaller quantity of nitrogen.

Fertilizers of high nitrogen content reduced dry-season yields, but those containing much phosphate gave yields significantly higher than those from fertilizers of lesser phosphate content. Determinations of the "available" phosphorus in the soil indicated very little accumulation, even in soils that were treated with 240 lb. of phosphate annually. Determinations of the soluble phosphorus content of the plants indicated that the nutrient was at a low level, even in plants treated annually with 240 lb. of phosphate to the acre.

The availability to plants of phosphates applied with cattle manure, A. R. MIDGLEY and D. E. DUNKLEE (*Vermont Sta. Bul.* 525 (1945), pp. 22, illus. 6).—The availability of phosphoric acid in superphosphate applied as a preservative for fresh cattle manure was determined in laboratory, field, and greenhouse experiments. The B horizon of a high phosphorus-fixing Podzol soil was used in the greenhouse experiments with tomatoes.

In greenhouse experiments with tomato plants and in field experiments with roughage crops, plant responses to the use of manure and phosphorus were almost universally better when the two materials were applied together than when they were applied separately. This was particularly true on high phosphorus-fixing soils. The workers indicated that the manure seems to "protect" the phosphate against excessive fixation in the soil.

Reduction of fixation was accomplished by the manure reducing the solubility of superphosphate; the large number of organisms in the manure may change some

of the phosphate into organic compounds which are less soluble but are still slowly available to plants; active humates may also absorb large amounts of phosphorus and hold it in a replaceable and available form; and since cattle manure is quite wet, it readily absorbs the applied phosphate so that when the material is spread on the land the phosphate goes with the pieces of manure. Thus, the phosphate is concentrated or "pelleted" and its soil contact and exposure to the fixing agents within the soil are greatly reduced. Each piece of phosphated manure acts as a storehouse or cupboard of well-balanced plant nutrients.

Use of superphosphate with manure in the barn gutter is deemed a good practice, from the standpoint of phosphorus availability, in the Northeast and in other sections where the soils fix phosphorus. The greater the phosphate-fixing capacity of a soil, the more important it becomes to thus reduce excessive soil contact by mixing the phosphate with manure. On the other hand, with low phosphate-fixing soils, it may be advantageous to distribute the phosphate more thoroughly within the soil. However, most eastern soils are not in this favorable position and require some means of protecting or concentrating the phosphorus. While the practice of adding superphosphate to manure is desirable, yet the value of directly using some phosphatic fertilizer for drilled or rowed crops should not be overlooked. In the latter case, the materials may be concentrated in hills or bands for immediately plant use. If band placement is used in conjunction with phosphated manure that has been plowed under, a high plant nutrient availability will remain over a long period of time.

In soils that fix phosphorus, pelleting, banding, and mixing phosphatic materials with manure have been found to markedly increase their availability. It has also been found that, within reason, the larger pellet size, the greater is the amount of phosphorus available to the crop on high phosphate-fixing soils.

Industrial precipitated tricalcium phosphates: Variance in chemical, structural, and fertilizer properties. W. H. MACINTIRE, S. H. WINTERBERG, H. L. MARSHALL, G. PALMER, and B. W. HATCHER. (Tenn. Expt. Sta. et al.). (*Indus. and Engin. Chem.*, 36 (1944), No. 6, pp. 547-551, illus. 2).—Seven samples of commercial precipitated calcium "triphosphates" were obtained from reliable dealers and subjected to chemical, optical, powder diffraction, and Neubauer tests and to pot culture studies. Monocalcium phosphate, five purchased dicalcium phosphates, and three prepared tertiary products were included as controls. The dicalcium phosphates were almost completely citrate-soluble and of uniform $P_2O_5 : CaO$ ratio. The tertiary precipitates varied in composition, solubility, and reactivity toward calcium fluoride, in optical properties, in X-ray powder diffractions, in Neubauer tests, in plant response, and in P_2O_5 recovery. Five precipitates were isotropes and two precipitates were anisotropes. Four precipitates were hydroxyapatites, and two were similar to but not identical with $\beta-Ca_3(PO_4)_2$. The solubility varied from 34 to 96 percent. Two lots from the same vendor varied by 100 percent in solubility. Variance in P_2O_5 uptake in Neubauer seedlings, in plant response, and in P_2O_5 recoveries were consonant with the values registered by chemical examinations of the precipitates. It is proposed in this paper that a standardized and certified precipitated tricalcium phosphate be provided as a control in chemical and biochemical research.

Effectiveness of fused phosphate of different particle size. G. L. TERMAN. (Ky. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 154-158).—In 4 years of pot experiments fused phosphate of various particle sizes was tested with several crops, and in two experiments fused phosphate size-separates were compared with like separates of triple superphosphate, three phosphate-deficient soils being supplied the phosphates at from 50 to 80 lb. to the acre (2,000,000 lb.).

Effectiveness of the fused phosphate increased generally with decrease in granular size and in fluorine content, 10- to 60-mesh being less effective than finer material.

The finest (270-mesh) was less effective for Sudan grass, however, than were intermediate sizes. Liming tended to lower the effectiveness of the coarser fused phosphates. Triple superphosphate showed increased effectiveness for wheat with increased particle size. Large differences among fused phosphates from the Tennessee Valley Authority (1936-43) could not be explained by particle-size or fluorine content differences.

Field tests showed no significant differences in yields of corn and wheat from plots receiving triple superphosphate or 6-mesh, 40-mesh, and 80-mesh fused phosphate.

Phosphate fixation by soil minerals.—III, Particle size, A. T. PERKINS and H. H. KING. (Kans. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 61-65).—In their third contribution of this series (E. S. R., 92, p. 340), the authors report upon the relative phosphate fixing capacity of nine minerals separated into particle-size fractions containing material of approximately 150 μ , 60 μ , 15 μ , and 2 μ particular diameters.

Of quartz, the coarse particles were found to be inert, whereas the fine fixed all the phosphate added. Of hematite, the coarse particles showed little phosphate-fixing capacity; the fine particles fixed about 12 times as much phosphate. Of muscovite, the finer particles fixed 20 or more times as much phosphate as did the coarser. The behavior of phlogopite was similar to that of muscovite, as was also the activity of biotite. Pyrophyllite fixed about 8 times as much phosphate in the finer state of division as in the coarser. Montmorillonite showed but little increase in fixation with decrease in particle size. Kaolin showed a fixation behavior intermediate between that of montmorillonite and that of the other minerals.

The mechanism of phosphate fixation by montmorillonitic and kaolinitic clays, R. COLEMAN. (Miss. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 72-78, illus. 2).—The author reports phosphate fixation studies made with kaolinitic and montmorillonitic fine clays (<0.2 μ) both before and after the free iron and aluminum oxides were removed from the clay minerals. The effect of time and pH upon the amount of phosphate fixed by the clays was determined, and the pH changes which occurred in the clay-phosphate system with phosphate fixation were measured.

Within the pH range of most soils (pH 5 to 7), montmorillonitic and kaolinitic clays fixed almost as much phosphate in 24 hr. as in 1 mo., but in the more acid reactions (below pH 5) both clays fixed considerably more phosphate in 1 mo. than in 24 hr. The phosphate fixation curves for montmorillonitic and kaolinitic clays suggested two different mechanisms for fixing phosphate, one which operated above pH 5 and fixed PO_4 immediately and another which operated below pH 5 and fixed PO_4 more slowly. The results suggested that little or no PO_4 was fixed by the clay minerals montmorillonite and kaolinite, but that all of the PO_4 was fixed by the free iron and aluminum oxides in the clays. Although the free iron and aluminum oxides in the clays were responsible for phosphate fixation, the small amounts of iron and aluminum oxides soluble at any given time in the clays did not account for the large amounts of PO_4 fixed by the clays. The increased pH of the clay-phosphate system after phosphate fixation indicated that anion exchange did occur, the phosphate ions in solution replacing the OH ions from the clay. There was evidence to indicate that phosphate ions replaced OH ions from the free iron and aluminum hydroxides rather than from the clay minerals. The results indicated that the large amounts of phosphate fixed below pH 5 in 1 mo. were due to the replacement of one hydroxide ion by one phosphate ion.

The use of nitroso-R-salt in the determination of exchangeable potassium in soils, J. F. REED, A. MEHLICH, and J. R. PILAND. (N. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 56-60, illus. 3).—The determination of exchangeable potassium in soils by a method which involves the use of nitroso-R-salt is described.

Procedures for determining potassium after its extraction from soils by N ammonium acetate, by 0.05 N hydrochloric acid, and by 0.2 N barium chloride buffered at pH 8.1 with triethanolamine are given.

Solutions of these extractants were made up to contain known concentrations of potassium. After preliminary treatments, potassium was precipitated as potassium sodium cobaltinitrite. Determinations were then made by turbidimetry, by permanganate titration, and colorimetrically by the nitroso-R-salt method. The turbidimetric method was found reasonably accurate when conditions were controlled and a sufficient number of readings were made. The nitroso-R-salt was accurate and reproducible in all extractants tried, and estimation with solutions containing as little as 1 p. p. m. of K was possible. The applicability of the nitroso-R-salt method to soil extracts in all three extracting solutions, obtained from soils varying widely in texture, content of organic matter, and base exchange capacity, was tested.

A good agreement between level of exchangeable potassium as determined by this method and response to potassium applications in the field was observed. In general, both barium and hydrogen extracted more potassium than did ammonium, but the order of exchangeable potassium in the soils studied was about the same with all three extractants.

The fixation of potash by a kaolinitic and a montmorillonitic soil, C. D. HOOVER. (Miss. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 66-71, illus. 2).—Potassium in the forms of the chloride and of dipotassium hydrogen phosphate was added in quantities increasing at four rates to a kaolinitic and a montmorillonitic soil of which the fine clay mineral fractions were known to be predominately kaolinite and montmorillonite, respectively. The two soils were stored moist and sampled after 1-, 3-, 9-, and 24-mo. periods, respectively, to determine water-soluble, replaceable, and acid-soluble (1 N nitric acid, 90° C. for 30 min.) K, respectively. Applied potash which could not later be recovered as water-soluble or replaceable K was considered "fixed."

Both soils fixed approximately as much potash in 1 mo. as they fixed over longer periods of time, although there were slight increases in fixation of K by the kaolinitic soil with time. An important relationship between free Fe and Al in montmorillonitic and kaolinitic clays and an increase in base exchange capacity resulting from the absorption of phosphate was indicated.

A comparison of potassium chloride and potassium metaphosphate as sources of potassium for plants, R. F. CHANDLER, JR. and R. B. MUSGRAVE. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 151-153, illus. 1).—Two field trials of calcium metaphosphate, potassium metaphosphate, and 20-percent superphosphate, carried over a 3-yr. period in both experiments, showed a tendency for potassium metaphosphate to outyield each of the other phosphorus carriers. The differences, however, were not statistically significant. It appeared, therefore, that "the only valid conclusion is that potassium metaphosphate is fully as good as the other phosphate carriers."

Greenhouse studies with Ladino clover showed that the potassium content of the plants was higher when the potassium was supplied as potassium chloride than when this element was supplied as the metaphosphate. These results were attributed to the greater solubility of the potassium chloride. The yields of Sudan grass under field conditions were consistently higher when the potassium was supplied as potassium metaphosphate rather than as potassium chloride. The potassium, calcium, phosphorus, iron, and aluminum contents of Sudan grass were not appreciably affected by the kind of potassium carrier.

Growth and nutrition of tomato plants as influenced by exchangeable sodium, calcium, and potassium, D. W. THORNE. (Utah Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 185-189, illus. 1).—Tomato plants were grown in a medium

consisting of quartz sand and a bentonite clay carrying various ratios of adsorbed sodium and calcium or potassium and calcium.

The yield of plants was decreased as the level of exchangeable sodium exceeded 40 percent of the exchange capacity of the clay. The highest level of sodium tolerated by the plants was between 60 and 70 percent of the total exchange capacity. The plants continued to grow with potassium saturating as much as 90 percent of the exchange capacity, but plant weights were reduced when potassium exceeded 60 percent of the exchange capacity. The sodium and potassium contents of the plants increased and the calcium contents decreased with increasing proportions of exchangeable sodium and potassium, respectively. Sodium was slightly more effective than potassium in reducing calcium absorption by the plants. The percentage of potassium in the plants was decreased with high levels of sodium on the clay. With the clay only 90 percent base-saturated, the phosphorus contents of the plants were not appreciably affected by varying the ratio of sodium to calcium. With the clay fully base-saturated, the phosphorus contents of the plants increased. Laboratory studies also showed an increase in phosphate solubility with an increased degree of sodium saturation. The iron content of the plants showed no consistent relationships to the degree of saturation of the clay with either sodium or potassium. The manganese content of the plants was decreased as the degree of potassium saturation increased.

Effect of certain fertilizer and lime treatments on some chemical properties of Cecil sandy loam. G. A. STRASSER, E. M. MATTHEWS, and S. S. OBENSHAIN. (Va. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 159-163).—Ground limestone increased crop yields and tended to increase organic matter content and base exchange capacity. The lower pH of the unlimed plots seemed to cause retention, as soil organic matter, of more of the total dry matter produced. A significant, positive correlation was found between organic matter content and base exchange capacity.

Varying additions of superphosphate and their combination with potassium chloride or with this salt and sodium nitrate appeared not to have affected exchangeable calcium, magnesium, and hydrogen contents. Ground limestone resulted in large increases of exchangeable calcium and magnesium, increases in exchangeable potassium, and marked decreases in exchangeable hydrogen.

Sodium, calcium, and magnesium ratios in the exchange complex. J. S. JOFFE and M. ZIMMERMAN. (N. J. Expt. Stas.). (*Soil. Sci. Soc. Amer. Proc.*, 9 (1944), pp. 51-55, *illus.* 1).—The calcium : magnesium : sodium ratios in Solonetz and solonchic soils are tabulated in a brief review. The methods used in introducing mixtures of cations in the exchange complex are discussed, with special reference to calcium : magnesium : sodium ratios. Data on the swelling, moisture absorption, and dispersion of soils containing various percentages of sodium, from 5 to 50, in the exchange complex carrying various calcium : magnesium ratios are given.

In pot experiments, Sudan grass was grown on soil-sand mixtures made up to contain six series of calcium : magnesium : sodium ratios. A sodium content greater than 10 percent of the total exchangeable cations produced injurious effects, even when accompanied by a high calcium : magnesium ratio. A low calcium : magnesium ratio had an effect like that of a high sodium content. Limits of the calcium necessary in the calcium : magnesium ratios to ameliorate the solonchic effects of sodium or of magnesium are indicated.

The effect of limestone and fertilizer treatments upon the growth and composition of spinach. F. T. TREMBLAY and S. C. VANDECAVEYE. (Wash. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 169-178, *illus.* 4).—Adding 3 tons of limestone raised the soil pH to a range desirable for the growth of spinach; Puget silt loam from pH 5.4 to pH 6.4, Chehalis silty clay loam from pH 5.8 to pH 6.2, and

Kitsap silt loam from pH 5.2 to pH 6.0. All fertilizer rations tested increased dry-weight yields from all soils when limestone was added, although the green weight of the crop from the Puget soil was not much increased. Leaf analysis indicated good mineral nutrient content. Where nitrogen was a limiting factor for growth, its omission from the fertilizer lowered the percentage of calcium in the crop as well as the yield. The Kitsap soil, on which the spinach could not continue growth without liming of the soil, yielded a crop superior to any other produced in the experiment after the soil had been limed.

The effect of chlorine in soils and fertilizers on its distribution in the potato tuber, J. M. MACGREGOR and C. O. ROST. (Minn. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 79-85).—Four soils of the part of the Red River Valley located in Minnesota were found to contain from 4 to 8 p. p. m. of water-soluble chlorine in the surface 6 in., a concentration much lower than those reported from other parts of the world.

Potato tubers grown on these four soils increased markedly in chlorine content upon the addition of water-soluble chlorides in the fertilizer, the chlorine concentration being always greater in the stem end of the tuber, even after several months' storage. When the potatoes were grown in these Red River Valley soils without added water-soluble chlorides, the tubers contained from one-half to one-fourth as much chlorine as has been reported to be present in tubers grown in unfertilized plats in England.

Some areas in eastern United States associated with deficiencies of cobalt and other elements in the soil, K. C. BEESON, L. GRAY, and S. E. SMITH. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 164-168).—Areas associated with nutritional troubles in grazing animals were found frequently to be deficient in the phosphorus, cobalt, or manganese content of their soils, multiple deficiencies being observed more often than not. Heavy fertilizer applications to improve yields may further complicate the situation, if carried out with insufficient attention to quality of the forage, especially with respect to its content of the trace-requirement elements. Treatment with superphosphate which increased yields of Sudan grass grown on a Dunkirk fine sandy loam near Ithaca, N. Y., resulted in neither an increase nor a decrease of nutritional quality as measured by feeding trials with lambs.

Commercial fertilizers, 1945, E. R. TOBEY (*Maine Sta. Off. Insp.* 197 (1945), pp. 33-63).—Analytical data resulting from the 1945 inspection are here recorded.

Inspection and analysis of commercial fertilizers, H. J. WEBB (*South Carolina Sta. Bul.* 363 (1945), pp. 108).—In addition to data on fertilizer inspection and analysis, the provisions of the new State fertilizer laws are discussed.

AGRICULTURAL BOTANY

Plant and animal populations of the Missouri River Valley in North Dakota, O. A. STEVENS (*North Dakota Sta. Bimo. Bul.*, 8 (1945), No. 2, pp. 20-25).—"The Missouri River Basin Comprehensive Plan authorized by the Seventy-Eighth Congress . . . would flood approximately three-fourths of the valley of the river in North Dakota;" this would destroy most of the existing vegetation and presumably cause considerable changes in the marginal portions. Practically no ecological studies and few botanical collections had been made in this area; thus no inventory of earlier conditions was at hand. This was the reason for the present survey of the vegetation composition of the region, involving the general topography, the trees, shrubs, and grasslands, the birds, and certain practical considerations relating to the potential losses to agriculture.

Comparative study of the vacuome and of related systems in plants and animals, J. DUFRENOY (*Biodynamica*, 5 (1945), No. 99, pp. 137-164).—Life seems to

require the presence in the protoplasm of a free water phase, represented in differentiated plant cells by vacuoles; in animals, the water phase is usually represented by less conspicuous, globular, filamentous, or reticular bodies such as those constituting the vacuome in meristematic plant tissues. One of the characteristics of the vacuoles is their content in phenol derivatives which play a role in the respiratory activity of the cell. These substances can be "fixed" by oxidants in the same way as the so-called Golgi apparatus in animal cells. Under the action of pathological agents or other stimuli, typical vacuoles may become dispersed into small droplets or filaments as the enclosing cytoplasm undergoes proteolysis and lipophanerosis (setting free of lipids). The resulting cytological patterns in many respects resemble those known as Holmgren's canaliculi and Golgi bodies. A striking analogy in chemical structure and enzymic behavior occurs between the catechol system of oxidation reduction which characterizes plant vacuoles and the tyrosine system (quite universally spread in nature and known particularly in the animal integuments).

When these redox systems get out of balance, irreversible oxidation occurs, resulting in the blackening of freed juices in plants and in the deposition of dark integumentary pigments in animals. Cancerous tissues of the "Melanoma" type suggest a correlation between cancerous growth and melanin formation; both might be due to in the inhibition of the SH group and the consequent throwing out of balance of their respective redox systems. The animal respiratory system furnishes many elements of analogy with the vacuome. In pathological cases (e. g., tyrosinosis or alcaptonuria) the excretory products of the kidneys are related to the products of unbalanced oxidation reduction of tyrosine. This similarity in nature and perhaps in origin concerns not only the excretion products of the kidneys but also the internal secretions of annex glands, such as adrenaline. Compounds related by structure and chemical properties to those of the vacuoles may aggregate in special glands. The vacuole also seems related in properties with some special biological systems, such as that concerned with the production of light. Bioluminescence involves enzymic oxidations analogous to those of hydroquinone; it is accompanied by proteolysis like many other redox processes; the bioluminescent system may occasionally work as a substitute for the respiratory system; its mode of action also is somewhat similar to the pigment-producing reactions characterizing the vacuolar contents. There are 65 references.

The existence of a three-generation cycle in several groups of lower plants and animals, B. LUYET (*Biodynamica*, 5 (1945), No. 98, pp. 129-136, illus. 2).—"In several groups of lower plants and animals, in particular among Chlorophytes, Flagellates and Sporozoa, the organism returns three times during the course of its development into the germinal stage (spore or gamete). Such organisms have, thus, a three-generation cycle. One of the three generations called here 'synkaryonic,' consists in the development of the zygote into spores. This cycle is usually associated with zygotic meiosis, that is, with the occurrence of meiosis in the first division of the zygote or of the synkaryon. The germinal cycles of most fungi, from the Chytrids to the Basidiomycetes, include the synkaryonic generation."

Historic foundations of botany in Florida (and America), W. A. MURRILL (*Gainesville, Fla.: Author*, 1945, pp. 51+).

[Botanical papers] (*Pa. Acad. Sci. Proc.*, 19 (1945), pp. 134-146).—The following are included: Allergenic Plants of Puerto Rico, by E. P. Claus (pp. 134-137) (Univ. P. R.); Observations on Talc as a Plant Hormone, by M. E. Duffy and A. J. Calloway (pp. 137-139); and Ecological Notes on Fungi [including those on a burned area, of a fallen red oak sapling, and of slash piles] (pp. 140-143) and New or Noteworthy Fungi From Western Pennsylvania—[an Annotated Listing] (pp. 143-146), both by L. K. Henry.

[Botanical papers] (*Tex. Acad. Sci. Proc. and Trans.*, 28 (1944), pp. 102-103, 130-132, 134-138).—The following brief papers are included: "Photoperiodism" Versus "Photoperiodicity," by V. A. Greulach; Studies on *Penicillium notatum* in Tissue Cultures, by C. M. Pomerat; and Chlorine in Plant Tissue, by E. R. Bogusch.

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, 50 (1945), No. 6, pp. 715-718).—Abstracts of the following papers are included: Studies on the Nature of the Thermophilic Fermentation of Cellulose—I, Oxygen Relations, by D. B. Pratt and P. A. Tetrault (p. 716), An Agar-Decomposing Organism Isolated from Soil, by F. J. Murray (pp. 716-717), and A New Sterile Technique for Preparing Agar Cup Plates, by J. E. Christian and M. L. Neuroth (p. 717) (all Purdue Univ.); and The Filter Paper Disc Method of Assaying Antibiotics, by J. M. McGuire (p. 717).

Carbol crystal violet, H. J. CONN. (N. Y. State Expt. Sta.). (*Stain Technol.*, 21 (1946), No. 1, pp. 31-32).—There is some call among bacteriologists for a "carbol gentian violet;" it is sometimes used as a general stain and sometimes in the gram technic, to be followed by treatment in iodine and decolorization. The formula recommended to prevent gelatinization with some dyes now on the market consists of solution A—crystal violet (Commission certified) 0.4 gm. and 95 percent ethyl alcohol 10 cc. and solution B—phenol 1 gm. and distilled water 100 cc. Solutions A and B are mixed for use. "This formula is recommended merely as an improvement on the Nicolle formula when carbol crystal violet is desired. It must be distinctly understood, however, that the writer still regards the ammonium oxalate formula as preferable, both in the gram technic and for ordinary bacterial staining."

Serological methods, revised by J. A. KENNEDY (*Pure Cult. Study Bact.*, 14 (1946), No. 1 [Leaflet 8, 5. ed. rev.], pp. 22+).—This section concerns the use of serology in pure culture study (with definition of terms), bacterial dissociation, agglutination, precipitation, complement fixation, and titration of toxins, toxoids, and antitoxins. There are 20 references.

Sources of amylase-producing bacteria, G. L. PELTIER and L. D. BECKORD. (Nebr. Expt. Sta.). (*Jour. Bact.*, 50 (1945), No. 6, pp. 711-714).—Members of a recent collection of 1,000 or more bacterial isolates from a variety of natural sources were grown on starch agar plates and the zones of starch hydrolysis noted; 265 hydrolyzed starch and were further cultured in a liquid wheat bran medium, the amount of amylase produced being determined from the dextrinizing activity of the medium. Of these isolates, 194 gave a dextrinization time of 60+ min.; 37, 1 to 10 min.; 25, 11 to 20 min.; 5, 21 to 30 min.; and 4, 31 to 60 min. Manures, composts, sludges, soils, and insects were extremely poor sources of these bacteria; ropy bread, flour, starches, and other plant materials were excellent to fair sources. Exposure of plates to the air proved fairly effective for picking up amylase-producing bacteria. A preliminary characterization of the high-amylase-producing isolates placed them in the *Bacillus subtilis* group.

Bacterial viruses or bacteriophages, M. DELBRÜCK (*Biol. Rev. Cambridge Phil. Soc.*, 21 (1946), No. 1, pp. 30-40).—This review (66 references) is restricted in the main to the advances of the preceding 3 yr. It concerns the morphology, classification by serological cross-reaction tests, mutations of bacteria from sensitivity to resistance, cross-resistance tests, reverse mutations and lysogenesis, the physiologic basis of resistance, mutations of viruses affecting their host range, one-step growth experiments, multiple and fixed infections, biochemical studies of virus multiplication, and connections with wider problems.

Acidity controlling antiseptics by weak acids, G. I. HUNTINGTON and O. RAHN. (Cornell Univ.). (*Jour. Bact.*, 50 (1945), No. 6, pp. 655-659, illus. 2).—The heightened antiseptic efficiency by increasing acidity of weak acids proved in the majority of cases to be due to the increase of undissociated molecules; this

fraction is the chief and in many cases the only compound with antiseptic properties. The experiments included acetic, propionic, butyric, chloracetic, bromopropionic, oxalic, selenious, and nitrous acids. Previous workers have shown the same to be true of benzoic, salicylic, sulfurous, and hydrochlorous acids, as well as for phenol. It is possible to compute the approximate dissociation constant of weak acids from the inhibitory doses at different acidities. Some antiseptics are equally efficient in the dissociated and undissociated forms—e. g., aniline and hydrozoic acid. For the latter it could be shown that the undissociated acid inhibits by a different mechanism than does the azide ion. Phthalic, nicotinic, sulfanilic, and tellurous acids as antiseptics proved too weak within the investigated range of pH 2.5-6 to permit conclusions.

Influence of pH on growth factor requirements of fungi and bacteria (*Nutr. Revs.*, 3 (1945), No. 12, pp. 357-358).—A brief review, from which it is concluded that the growth requirements of organisms may be affected quantitatively and in some cases even qualitatively by changes in the pH of the medium. "For an adequate explanation of the effects exerted by pH a more detailed knowledge of bacterial metabolism than we at present possess will be necessary."

A new sterile technic for preparing agar cup-plates, J. E. CHRISTIAN and M. L. NEUROTH (*Science*, 103 (1946), No. 2667, pp. 172-173, illus. 2).—The agar cup-plate method has found considerable application as a test for bacterial inhibitory properties of many substances. By the new technic, sterile flat-bottomed pyrex glass rods—the diameter of which determines the size of the agar cup—are placed in the liquid agar in a petri dish. After the agar has hardened, each glass rod is heated via a small heating element slipped over the end of the rod. The agar melts evenly around the rod, which is then easily removed, leaving a uniform agar cup. The small amount of agar melting adjacent to the rod flows to the bottom and solidifies, forming an agar seal at that point.

A broth dilution method of assaying streptothricin and streptomycin, R. DONOVICK, D. HAMRE, F. KAVANAGH, and G. RAKE (*Jour. Bact.*, 50 (1945), No. 6, pp. 623-628).—The method described is believed more sensitive and somewhat more accurate than procedures heretofore described for assay of these substances.

Assay of streptomycin by the paper-disc plate method, Y. H. LOO, P. S. SKELL, H. H. THORNBERRY, J. EHRLICH, J. M. MCGUIRE, G. M. SAVAGE, and J. C. SYLVESTER. (Univ. Ill. et al.). (*Jour. Bact.*, 50 (1945), No. 6, pp. 701-709, illus. 3).—A method is described for quantitative determination of streptomycin by the filter paper disk agar plate diffusion technic, with *Bacillus subtilis* as test organism. The influence of various factors on the assay is reported and discussed. This procedure has proved satisfactory in assaying surface and submerged-culture beers and preparations obtained in isolation and purification processes.

The control of contaminants in penicillin fermentations by antiseptic chemicals, S. G. KNIGHT and W. C. FRAZIER. (Wis. Expt. Sta. et al.). (*Jour. Bact.*, 50 (1945), No. 5, pp. 505-516).—In tests of 37 chemicals for their powers in shake flask fermentations, only borax and boric acid could be used at a level high enough to delay the growth of contaminants and still not interfere with penicillin production by strains of *Penicillium notatum* and *P. chrysogenum*. Eighty-gallon pilot fermentations with one strain in a medium containing 0.2 percent borax yielded more penicillin in 24 hr. than similar fermentations without borax; later fermentations without borax yielded more penicillin than those with it.

Chemical changes in submerged penicillin fermentations, H. KOFFLER, R. L. EMERSON, D. PERLMAN, and R. H. BURRIS. (Wis. Expt. Sta. et al.). (*Jour. Bact.*, 50 (1945), No. 5, pp. 517-548, illus. 10).—Studies of the various factors influencing penicillin production included an investigation of the chemical changes during fermentation. Since the body of observations is so large that an adequate presentation

of the data would require an inordinate amount of space, much of the material here given consists of generalizations, followed by representative illustrative data. The penicillin fermentation by *Penicillium notatum* and *P. chrysogenum* can be divided conveniently into three phases as distinguished by pH rise, varying respiratory intensity, change in mycelial weight and composition, penicillin production, and shift in the composition of the medium; these phases are taken up in detail. The various strains studied exhibited but slight differences in metabolism. Increased O₂ supply changed not only the penicillin level and the time necessary to achieve the peak, but also the associated metabolic picture. Among fermentations set up under similar conditions a correlation existed between the ammonia levels and penicillin yields; this relationship is discussed.

The effect of certain chemicals on penicillin production and mold metabolism in shake flask fermentations, H. KOFFLER, S. G. KNIGHT, R. L. EMERSON, and R. H. BURRIS. (Wis. Expt. Sta. et al.). (*Jour. Bact.*, 50 (1945), No. 5, pp. 549-559).—Of 49 chemical compounds and mixtures tested for ability to raise penicillin levels in shake flask cultures, only citric acid and borax or boric acid proved stimulatory; the degree varied with the strains. The effect of the last two was found due to their B content rather than to pH or impurities. The general tendency of borax and compounds of doubtful stimulatory power was to stimulate runs with low-yielding, but not with high-yielding control, fermentations. Lists of chemicals that might stimulate penicillin production but whose action was irregular and of those lacking in stimulatory or possessing depressing powers are enumerated. The findings suggest that stimulatory substances may become commercially important and indicate how they could be used as tools for studying the mechanism of penicillin production.

Toxicity and antibiotic activity of kojic acid produced by *Aspergillus luteovirescens*, H. E. MORTON, W. KOCHOLATY, R. JUNOWICZ-KOCHOLATY, and A. KELNER (*Jour. Bact.*, 50 (1945), No. 5, pp. 579-584).—The authors isolated kojic acid from a culture of this fungus and tested its inhibitory concentration dissolved in nutrient agar against 166 bacterial strains; the results are tabulated. Two species of *Leptospira* proved especially susceptible. The minimal lethal dose of kojic acid for 17-gm. mice injected intraperitoneally was about 30 mg. per mouse.

Molds and bacteria that delaminate plywood bonded with casein and soybean glues, C. M. CHRISTENSEN and C. S. MOSES. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., Forest Path. Spec. Release 25* (1945), pp. 12+, illus. 5).—This study was undertaken to increase the information on molds and bacteria concerned in the break-down of protein glues used in plywood and to determine the conditions under which the various organisms attack such materials. *Penicillium brevicaulis* and *P. glaucum* made up a major part of the mold flora involved; either one, working with bacteria, proved able rapidly to delaminate plywood glued with any of five casein glues and one soybean glue tested. The nine commercial brands of powdered casein glues and the one soybean meal examined all contained an abundance of the same kinds of yeasts and bacteria but comparatively few molds. Only a few kinds of bacteria survived in the liquid glues and in the glue lines of plywood; these few, however, survived in considerable numbers and were able to delaminate surface-disinfected specimens at a moisture content of 50 to 65 percent or when soaked in water. Sodium orthophenylphenate appeared more effective against bacteria than against *P. brevicaulis*, and sodium trichlorophenate prevented any weakening by either the molds or bacteria tested. Specimens glued with two commercial brands of casein glues retained their original strength over the 7-mo. test period when soaked in water plus 2 percent sodium pentachlorophenate, but were delaminated within 3 mo. when soaked in water to which bacteria and a small amount of casein had been added or when merely surface-disinfected

and soaked in water alone. The data available do not conclusively demonstrate that purely chemical hydrolysis occurs; experiments in which bacteria are entirely eliminated will be required to settle this question.

Factors affecting the production of resistant sporangia of *Allomyces arbuscula*, R. C. JONES. (Wash. State Col.). (*Mycologia*, 38 (1946), No. 1, pp. 91-102, illus. 1).—On the basis of experimental data presented, it is concluded that temperature is an important controlling factor in producing resistant sporangia in cultures grown on maltose-peptone agar, and that within limits the total amount of temperature to which cultures are subjected is of more significance than minimum or maximum temperatures or degrees of fluctuation. The findings suggest high aggregate temperature as a principal factor responsible for the frequent failures of resistant sporangia to form during the summer.

Isolates intermediate between *Stachybotrys* and *Memmoniella*, R. K. ZUCK. (U. S. D. A.). (*Mycologia*, 38 (1946), No. 1, pp. 69-76, illus. 2).—Isolates of an intermediate nature between these two fungus genera are reported. *Stachybotrys*-like slimy heads of elliptical to oval spores and *Memmoniella*-like heads of chains of spherical spores can occur on separate phialophores on the same hypha, or separately on the two phialophores of a branched phialophore. Single-spore isolates of cultures exhibiting this phenomenon continued to do so, whether the single spore was of one or the other type. Isolates stable for the characters of *M. echinata* for 8 yr. are also reported. The form genera *Memmoniella* and *Stachybotrys* are considered to be valid entities.

A remarkable fission yeast, *Schizosaccharomyces versatilis* nov. sp., L. J. WICKERHAM and E. DUPRAT. (U. S. D. A.). (*Jour. Bact.*, 50 (1945), No. 5, pp. 597-607, illus. 2).—The species described was isolated from home-canned grape juice, which was under considerable gas pressure but whose flavor, though considerably altered and alcoholic, had not suffered. The mode of ascospore formation suggested the genus *Schizosaccharomyces*, but the hyphal formation strongly resembled that in *Endomyces*.

Guignardia rhododae, the perfect stage of *Phyllosticta maxima* on rhododendron, B. H. DAVIS. (N. J. Expt. Stas.). (*Mycologia*, 38 (1946), No. 1, pp. 40-51, illus. 2).—An ascigerous stage—originally described as *Sphaerella* (*Laestadia*) *rhododae*—is here connected via pure cultures with its pycnidial stage *P. maxima* Ellis & Ev. and its spermagonial stage *P. saccardoi*. The characteristics of the perithecial stage are considered to be those of the genus *Guignardia*, and the name *G. rhododae* n. comb. is proposed and the synonymy listed. *P. maxima* is considered a distinct species and not synonymous with *P. rhododendri*. It is also believed distinct from the fungus determined by Tengwall as *P. maxima* and reported as the imperfect stage of *Venturia rhododendri*.

Additions to the Fungi Imperfecti on grasses in the United States, R. SPRAGUE. (U. S. D. A. and N. Dak. Expt. Sta.). (*Mycologia*, 38 (1946), No. 1, pp. 52-64, illus. 2).—The fungi collected by the author and here listed and described are seven species of *Septoria* (including *S. digitalivora* n. sp.), three of *Stagonospora*, and one each of *Macrophoma*, *Cercospora*, and *Ophiodocladium*; *O. hordei* is changed to *Ovularia hordei* n. comb. There are 21 references.

Studies of types and authentic specimens of *Hypoxylon*, I. C. L. SHEAR. (U. S. D. A.). (*Lloydia*, 8 (1945), No. 4, pp. 245-262, illus. 5).—The author "has accumulated a considerable number of notes during the past 50 yr. based upon his studies of type and authentic material representing most of the species of *Hypoxylon* of the older authors and many of the more recent ones;" this paper presents the results of these taxonomic studies for some 20 species of the genus.

Medicinal herbaceous species in the northeastern United States, R. H. CHENEY. (*Bul. Torrey Bot. Club*, 73 (1946), No. 1, pp. 60-72).—Except for consider-

able numbers of plants of *Convallaria majalis*, only a relatively few plants or a small quantity of seed are said to be available for the 10 cultivated species of drug plants found in this survey; the relative scarcity of the drug plant propagation of each of these 10 species for which quantitative data were obtained is indicated. The wild herbaceous medicinal species occurring in the area include actual and potential sources mostly of minor therapeutic significance; when not of major medicinal value they are, however, of interest from the standpoint of availability for breeding. The data presented should prove important not only for possible collection and emergency utilization but also because certain species might be developed as the basis for a future drug source industry in this area which would offer a protection against possible shortages during national emergencies. The wild herbaceous species possessing medicinal value and growing spontaneously throughout the eight States—as shown in this survey—are tabulated to show botanical origin, common name and habitat, part used, drug name and status, and medicinal use; the 10 cultivated species are similarly tabulated. The wild species involve 51 genera and 67 species; except for 2 genera and 3 species, they are all angiosperms.

A contribution to our knowledge of the wild and cultivated flora of Delaware, I. H. N. MOLDENKE (*Torrey*, 45 (1945), No. 4, pp. 106–109).—An annotated list of 66 collections of Delaware plants, representing 60 species and sub-specific entities in 53 genera and 27 families.

Pinus: The fertile species hybrid between knobcone and Monterey pines, P. STOCKWELL and F. I. RIGTER. (U. S. D. A. coop. Univ. Calif.). (*Madroño*, 8 (1946), No. 5, pp. 157–160).—*P. attenu radiata* n. hybr. is described, and the morphological characters distinguishing it (*P. attenuata* × *P. radiata*) from the parent species are tabulated.

A new alpine Glyceria from California, A. A. BEETLE. (Univ. Calif.). (*Madroño*, 8 (1946), No. 5, pp. 160–161).—The new grass species *G. californica* is described.

A review of the status of several American species of Dalea, R. T. CLAUSEN. (Cornell Univ.). (*Bul. Torrey Bot. Club*, 73 (1946), No. 1, pp. 80–85).—This paper presents a study undertaken primarily to determine the proper scientific name of the species of *Dalea* native to southern Florida. As a result, *D. emphyssodes* n. comb. is described, along with three geographical subspecies which appear sufficiently isolated and differentiated to warrant recognition.

Studies in Nicotiana.—III, A taxonomic organization of the genus, T. H. GOODSPEED (*Calif. Univ. Pubs. Bot.*, 18 (1945), No. 15, pp. 335–343).

Notes on Trifolium eriocephalum Nuttall, J. S. MARTIN (*Madroño*, 8 (1946), No. 5, pp. 152–157, illus. 1).—This native clover and its four varieties are revised in an attempt to correct nomenclatorial difficulties.

Vegetation of the Brule Basin, past and present, N. C. FASSETT (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 33–56, illus. 28).—An ecological study of this river basin of northern Wisconsin.

A survey of the larger aquatic plants and bank flora of the Brule River, [Wisconsin], J. W. THOMSON, JR. (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 57–76, illus. 15).

Some aquatic and sub-aquatic plants from the region of Glacial Lake Wisconsin, J. CATENHUSEN (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 163–169, illus. 1).—An annotated list.

List of publications dealing with Wisconsin limnology, 1871–1945, C. JUDAY and A. D. HASLER. (Univ. Wis.). (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 469–490).

A list of algae chiefly from the alpine zone of Longs Peak, Colorado, W. KIENER. (Univ. Nebr. et al.). (*Madroño*, 8 (1946), No. 5, pp. 161–173).—An annotated list.

Jerome bog, a peat-filled "Carolina bay," M. F. BUELL. (N. C. State Col.). (*Bul. Torrey Bot. Club*, 73 (1946), No. 1, pp. 24-33, illus. 4).—This study presents a description and the dynamic relationships of the bog vegetation characteristic of peat-filled "bays"—elliptical depressions—on the coastal plain of North and South Carolina.

Forest types of the Caribbean Islands, I, H. STEHLÉ (U. S. Dept. Agr., *Forest Serv., Caribbean Forester*, 6 (1945), Sup., pp. 273-408, illus. 14).—Introductory sections present 46 literature references and briefly take up definitions and concepts of the forest types of the area, the effect of natural factors on forest vegetation, the edapho-climatic basis for and physiognomic aspect of forest types, and the forest types, subtypes, and facies of the Caribbean, with a proposal for their general classification. The main body of the ecological monograph follows the forest types: Mangrove, xerophytic, mesophytic, hygrophytic, and altitudinal forests; the first three are considered in this part. Scientific and common names, density, and mechanical properties are tabulated for various species.

The structure and reproduction of the virgin forest of the North Temperate Zone, E. W. JONES (*New Phytol.*, 44 (1945), No. 2, pp. 130-148, illus. 5).—Although the northern temperate and Arctic forest regions are reasonably well known floristically, present knowledge of the more fundamental aspects of the ecology of their primeval forests is almost as scanty as that relating to tropical forests. In this paper "an attempt will be made to review [49 references] some features of the structure and reproduction of the north temperate virgin forests and to consider their bearing on ecological theory." Some reference is also made to Arctic forests.

The bur oak openings in southern Wisconsin, A. B. STOUT (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 141-161, illus. 2).—This is an ecological-historical study of the bur oak openings, which were the principal timbered lands over a considerable part of southern Wisconsin when this region was homesteaded about 100 yr. ago; the coming of the white man spelled their doom. The land occupied was fertile, there was sufficient timber for immediate needs, yet the tree stands were so sparse that clearing involved relatively little labor. Within 50 yr. most of the oak openings were converted to fields of corn, wheat, oats, and tobacco or were filled in by second growth which was mostly of invading black oaks. At the present time—after another 50 yr.—there exist only a few scattered remnants of the once numerous bur oak openings.

Criteria of nutritive relations of fungi and seed-plants in mycorrhizae, D. T. MACDOUGAL and J. DUFRENOY (*Plant Physiol.*, 21 (1946), No. 1, pp. 1-10).—The nutritive relations of associated plants may vary by minute gradations from pathogenic parasitism through symbiosis to effects purely mechanical and incidental. The main components of protoplasm may be elaborated by the fungi of orchid and pine mycorrhizas and translocated to the cortex. The reactions of cells in the higher plants entered by fungi is determined by the balance between the agencies activating H and those activating O₂. Decompensated respiration—especially in cells of the pericycle and endodermis—results in polymerization of the quinoids into gummy tannin masses, forming a barrier to extension of the hyphae. The technic of cytochemical analysis of nutritive relations is described. The minute seeds of terrestrial orchids present many possibilities of genetical modification which might result from the action of environal factors and especially of substances received from associated fungi entering the embryo at an early stage. Accelerated metabolism and translocation of foreign nucleoproteids and P complexes are of special significance. The principal mutations include loss of roots, reductions or total loss of photosynthetic mechanisms, and acquisition of a capacity to mature seeds in the absence of photosynthesis.

Growth stimulation and phosphorus absorption of mycorrhizal and non-mycorrhizal northern white pine and Douglas fir seedlings in relation to fertilizer

treatment, A. L. McCOMB and J. E. GRIFFITH. (Iowa Expt. Sta.). (*Plant Physiol.*, 21 (1946), No. 1, pp. 11-17, illus. 4).—Two-year old seedlings of northern white pine and Douglas fir made very satisfactory growth on O'Neill soil inoculated with coniferous humus containing mycorrhizas. On uninoculated soil fertilized with P, white pine seedlings formed mycorrhizas and made satisfactory growth; Douglas fir seedlings—although responding moderately to P fertilization—did not form mycorrhizas or maintain normal growth rates. Excepting uninoculated Douglas fir, good growth was in every case associated with high P absorption. That Douglas fir made poorer growth on uninoculated fertilized plots than on inoculated plots (even though seedling P levels were high) and gave no response from N and K suggests a mycorrhizal stimulus above that directly due to P; it is possible that this stimulating effect of mycorrhizal fungi on conifer seedlings may be due to heightened metabolism, associated in this instance with transfer of P and growth stimulators from fungus to seedling.

Effective and ineffective strains of legume nodule bacteria, H. G. THORNTON (*Nature [London]*, 156 (1945), No. 3970, pp. 654-655, illus. 1).—A brief summary of studies at Rothamsted on the nature of the ineffective response, changes in effectiveness of bacterial strains, and infection by mixed strains.

Influence of external and internal factors on growth hormone in green plants, F. G. GUSTAFSON (*Plant Physiol.*, 21 (1946), No. 1, pp. 49-62).—Poor mineral nutritive conditions, low temperature, and high light intensities lowered the growth hormone content in the tomato and corn plants investigated. Stems of *Helianthus annuus* and *Impatiens balsamea* parasitized by *Cuscuta polygonorum* had a higher growth hormone content than stems not so parasitized. Corn seedlings devoid of chlorophyll—either from growth in the dark or because of their genetic constitution—had more growth hormone than did similar plants with chlorophyll. As a plant part or the plant as a whole aged, its growth hormone content became less. Flower buds formed first in a tomato inflorescence had more hormone and were more likely to set fruits than those formed later.

Histological reactions of bean plants to certain of the substituted phenoxy compounds, J. M. BEAL (*Bot. Gaz.*, 107 (1945), No. 2, pp. 200-217, illus. 13).—Four substituted phenoxy compounds (0.5 percent in Carbowax 1500 or lanolin) were applied at the bases of nearly full-sized heart-shaped bean leaves; lanolin proved ineffective as a carrier for 2-chlorophenoxyacetic and Carbowax for 4-chlorophenoxyacetic acids. The gross responses to the weaker concentrations were nearly identical with those previously reported (E. S. R., 92, p. 627). In histological studies of material collected and preserved at 12-hr. intervals up to 480 hr., certain marked differences in response were observed between the second and first internodes; there were also differences in the degree of response of plants to the four compounds, though 2,4-di- and 2,4,5-trichlorophenoxyacetic acids resulted in strikingly similar responses. The second internode exhibited little or no histological response to 2-chlorophenoxyacetic acid; when treated with the other three compounds, however, it became much swollen and in a high proportion of the plants usually failed to elongate appreciably. Except for the epidermis, possibly the pericycle, and limited portions of the outer cortex, all other tissues responded actively, but no adventitious roots developed, even after 20 days. The histological responses in the first internode and hypocotyl were strikingly similar from all four materials but—in contrast to the second internode—only the endodermis, cambium, phloem, and ray parenchyma were activated; roots developed abundantly.

Growth inhibition in pea seedlings, E. D. BRAIN (*Nature [London]*, 156 (1945), No. 3961, p. 397).—Observations were made on garden pea seedlings after treatment with H 11 extract of urine (an alcoholic extract from Hosea Research Laboratories) and three of its fractions, β -indoleacetic acid, and three anthraquinone com-

pounds. The results (tabulated) show that substances causing inhibition may not cause swelling in the stem, and that auxin application may inhibit without causing swelling if the actively growing internodes of the stem are removed.

Plagiotropism and correlative inhibition, R. SNOW (*New Phytol.*, 44 (1945), No. 2, pp. 110-117, illus. 1).—In decapitated seedlings of the royal snapweed (*Impatiens roylei*) a cap of heteroauxin paste can replace the main shoot apex in making the lateral shoots epinastic. The plagiotropic laterals are not inhibited at all by the main shoot apex, but if they are deprived of developing leaves they become more nearly orthotropic and are then inhibited by the main apex like the normally orthotropic laterals of other species. In various other species also the plagiotropic laterals rise when similarly defoliated or darkened, or both. In the plagiotropic laterals of *Salvia coccinea* when the epinastism and negative geotropism are acting in different planes, they are both diminished greatly by defoliation and darkening. The findings are discussed, and it is considered that they render more probable the conclusion that induced epinastism and correlative inhibition are equivalent. It is further pointed out that in any case plagiotropism and liability to correlative inhibition exclude each other in the lateral buds of the orthotropic main shoots of a wide variety of species and also in lateral organs other than shoots. Some plagiotropic buds inserted on plagiotropic branches are, however, inhibited, and a more general rule is proposed to cover these also.

A histochemical study of the distribution of phosphatase in plant tissues, H. C. YIN (*New Phytol.*, 44 (1945), No. 2, pp. 191-195).—High phosphatase activity was found in the meristematic tissues, chlorophyllous cells, and phloem elements. The possible role of phosphatase in plant metabolism is discussed.

Relation of temperature to reproduction in sugar beets, M. STOUT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 2, pp. 49-68, illus. 6).—A measurement of the relative influence of storage temperature in reproductive development in sugar beets was made via bolting tests in a warm environment under long photoperiods. In general, beets bolted more rapidly and in larger numbers after storage at 6° to 9° C. than at cooler temperatures for similar periods. Storage near 0° induced little change in the rate and percentage of bolted plants, indicating that the processes involved in thermal induction are nearly arrested during such storage. Reversal of thermal induction occurred in beets that had been thermally induced, when they were stored at 11° to 26°. The rate of both thermal induction and reversal of the process increased with rise in temperature, the coefficient of reversal being about 3.3 between 13° and 19°. The maximum amounts or degrees of thermal induction possible within the favorable temperature range appear to form a gradient. There appears to be a continuity in the rate of any thermally induced change.

Observations on frost injury in peaches at Bathurst Experiment Farm, season 1944-45, J. D. BRYDEN and E. J. LINDSAY (*Agr. Gas. N. S. Wales*, 56 (1945), No. 12, pp. 553-555, illus. 1).—The most significant points revealed by the 1-yr. observations reported were (1) the dominant influence of altitude as distinct from local height in relation to surroundings, (2) that vigor and tree health have an important bearing on the ability of buds and trees to withstand low temperatures, and (3) the lack of evidence of outstanding frost tolerance or susceptibility exhibited by any peach variety observed.

Detached leaf culture, C. E. YARWOOD. (Univ. Calif.). (*Bot. Rev.*, 12 (1946), No. 1, pp. 56).—The author reviews (332 references) the physiology of detached leaves and the effect of detachment on normal life processes, the mechanics of culture, and conditions affecting the life of detached leaves. Unlike detached roots, detached leaves have not yet been induced to grow indefinitely, but individual leaves have been kept living up to 6 yr.; with the best known technics, most detached leaves

can be kept in good condition for about 3 weeks—long enough for most physiologic studies. They carry on most of the functions of normal attached leaves and are more easily subjected to detailed experimental manipulation. Since food materials do not escape in important amounts through cut petioles, they are well suited to studies in which translocation is to be eliminated as a complicating factor. By culture in darkness, carbohydrate transformations can also be advantageously studied. Detached leaves have served as a convenient substrate for total culture of plant pathogens, especially the obligate mildews and rusts. Carbohydrate nutrition, environmental effects on disease development, host range, physiologic specialization, heterothallism, formation of overwintering stages, respiration, and volatile fungicides are some of the phases of obligate parasitism successfully studied by this method. Furthermore, use of detached leaves as a substrate for insect study is suggested as a relatively unexplored field holding much promise.

Electric control of polar growth in roots of *Allium cepa*, E. J. LUND, R. I. MAHAN, and A. H. HANSZEN (*Soc. Expt. Biol. and Med. Proc.*, 60 (1945), No. 3, pp. 326-327, illus. 1).—In this preliminary report the authors describe an apparatus which applies an electric current—having parallel isopotential lines and appropriate current density—up and down the polar axis of a root so as to coincide with the orientation of the general axis of the inherent electric field of the root as well as that of gravity; the apparatus also maintains the roots under normal conditions of growth except for the applied current.

Water relations of the yeast cell, I, II, E. A. V. MONTGOMERY and J. WHITE (*Jour. Inst. Brewing*, 51 (1945), No. 6, pp. 279-289, illus. 5).—The following are included:

I. *Distribution of water in pressed bakers' yeast and methods for determination of water content of yeast cells; viscometric methods for demonstration of variation in water content of yeast cells and for determination of yeast consistency* (pp. 279-284).—A method is presented whereby the distribution of water both inside and outside the cells of bakers' yeast can be measured. Use of this technic indicated that the water content of the average yeast cell is about 64 percent; variations of ± 3 percent have been found. The total moisture content is shown not to be a true guide to yeast consistency, which depends on the distribution of the total water both inside and outside the cell. Yeast consistency can be measured by a viscometric method; this also shows up the plasmolytic effect of saline solutions on yeast much more delicately than it can be under the microscope. The viscometer has also been used to measure the actual quantity of yeast (calculated as yeast of a definite standard consistency) present in yeast suspensions.

II. *Increase and decrease in the moisture content of the yeast cell by chemical means; adsorption of albumin and peptone by yeast* (pp. 285-289).—The distribution of water inside and outside the cells can be varied by treatment with salts, alkalies, and acids; figures are given showing the quantitative effects of such substances. Treatment of yeast at low pH values with acid solutions destroyed the cells. With H_2SO_4 , values below pH 1.8 commenced to break up the cells; with HCl, the destruction began at pH 1.5. The figures quoted indicate a quantitative adsorption of albumin and peptone on yeast at various pH values; the similarities between this adsorption and the increase in yeast weight at low pH values were striking.

Adaptation to drought, T. A. BENNET-CLARK (*Roy. Col. Sci. [London]*, *Sci. Jour.*, 15 (1945), pp. 99-102).—A lecture on plant adaptations to drought.

Absorption of water through suberized roots of trees, P. J. KRAMER (*Plant Physiol.*, 21 (1946), No. 1, pp. 37-41, illus. 1).—The water-absorption rate through heavily suberized roots (3.2 to 17 mm. diameter) of small shortleaf pine trees growing in the open was determined by attaching potometers to their roots. Measurable absorption occurred through all roots studied; absorption of water from moist soil

by suberized roots also took place. Comparison of the rates of water movement through segments of pine and dogwood roots indicated the latter to be much the more permeable. Water absorption through suberized roots is believed to be vitally important in evergreen trees during winter when root growth is much reduced or stopped and the roots become suberized to their tips; it is probably also of some significance in summer—particularly after the cessation of a drought which has stopped root elongation.

Entrance of water into suberized roots of trees, R. M. ADDOMS (*Plant Physiol.*, 21 (1946), No. 1, pp. 109-111).—Microscopic examination of roots of yellow poplar, shortleaf pine, and sweet gum trees that had been immersed in colored solutions under vacuum indicated that considerable amounts of dye—and therefore presumably of water—could enter old suberized roots, and that there was an appreciable difference among different kinds of trees in the quantities that entered. Much more dye was observed in yellow poplar than in shortleaf pine, and preliminary observations appeared to show that sweet gum is intermediate between the two. Three avenues of entrance were observed, viz, lenticels, breaks around branch roots, and wounds. Comparative studies of roots of yellow poplar and shortleaf pine suggested that differences among kinds of trees as to capacity for absorption through suberized roots are attributable in part to anatomical characteristics of the bark on the roots, especially the number of lenticels and the completeness of coverage by the periderm of the inner living portion of the bark.

Mineral requirements of *Lemna minor*, R. A. STEINBERG. (U. S. D. A.). (*Plant Physiol.*, 21 (1946), No. 1, pp. 42-48).—Common duckweed was grown in aseptic culture for 13, 14, or 27 days at 25° C. with continuous light (500 ft.-c. fluorescent lamps) using fixed limited amounts of nutrients. The effects of deficiencies in micronutrients are described. Efficiency in salt utilization was found to depend on the C nutrition level of the plant and reached a maximum value of 16.3 (yield/salt) or the equivalent of 6.1 percent salts for each unit of yield. Quantity and quantity ratios of nutrient salts were important factors in growth.

On phosphoric esters in barley, C. R. C. HEARD (*New Phytol.*, 44 (1945), No. 2, pp. 184-190).—"Trichloroacetic acid extracts of 7-day-old etiolated barley seedlings were analyzed for a number of phosphorus fractions. The total soluble phosphate averaged 0.064 mg. phosphorus per seedling shoot. The extracts were hydrolyzed in N HCl for 7, 60, and 180 min. at 100° C. and in N NaOH for 20 min. at 20° and the inorganic phosphorus content measured before and after hydrolysis. About 90 percent of the total phosphorus was contributed by inorganic phosphate and phosphoric esters not hydrolyzed in 180 min. The proportion contributed by each of these fractions varied greatly, but normally inorganic phosphorus was the greater. The fraction of the phosphorus liberated by 180-min. but not by 7-min. hydrolysis was of doubtful significance and seemed in general to vary according to the size of the unhydrolyzable fraction. Reasons are given for supposing that the 180-min. fraction does not represent a distinct ester, such as hexosediphosphate, but results from partial hydrolysis of hexose-6-phosphate, the probable constituent of the unhydrolyzable fraction. Triosephosphate and phosphopyruvate were not present in measurable amounts. An average of 6 percent of the total phosphorus was released by 7-min. hydrolysis. It could be precipitated by calcium in alkaline solution and is regarded as a distinct fraction, probably adenylypyrophosphate or some similar phosphate carrier. The results are discussed in the light of isolations of phosphoric esters from plant material reported by other workers and of the role of phosphoric esters in barley respiration."

Decomposition of tartrates by some common fungi, T. C. STADTMAN, R. H. VAUGHN, and G. L. MARSH. (Univ. Calif.). (*Jour. Bact.*, 50 (1945), No. 6, pp. 691-700, illus. 3).—Study of 19 common fungi—mostly Fungi Imperfecti—indicated

species of *Aspergillus*, *Penicillium*, and *Fusarium* to be the most active decomposers of calcium tartrate, potassium bitartrate, and tartaric acid. The mycelial and conidial types of *F. solani* f. *cucurbitae* and *P. digitatum* were found to differ somewhat in ability to decompose tartrates; such physiological differences between these two forms may explain the many variations and apparent contradictions encountered in the literature dealing with fungus metabolism, since both are commonly associated in cultures carried by the mass transfer technic.

The rates of decomposition of tartrates in tryptone solutions by *A. niger* were studied. No appreciable destruction occurred during the first 5 days while the mold mat was developing, but continued incubation resulted in the rapid decomposition of potassium bitartrate and tartaric acid until after 16 days 90 percent had been utilized. After the initial lag period the decomposition rate for calcium tartrate was constant at 2 percent per day. The initial lag period of about 5 days renders improbable any loss of tartrate due to molds during normal commercial recovery practices.

Experiments were set up to determine the effect of moisture on the ability of fungi to decompose tartrate. *A. niger* and *P. digitatum* grew and decomposed significant amounts of crude calcium tartrate at 10 and 25 percent moisture levels; at 5 percent no decomposition occurred. To prevent losses from mold growth it is therefore recommended that tartrate-containing materials be dried and stored at 5 percent or less of moisture.

Biochemical changes involved in the decomposition of hemp bark by pure cultures of fungi, W. H. FULLER and A. G. NORMAN. (Iowa Expt. Sta.). (*Jour. Bact.*, 50 (1945), No. 6, pp. 667-671).—The rate of decomposition and biochemical changes involved when green unretted hemp bark was inoculated with pure cultures of *Alternaria*, *Hormodendrum*, *Fusarium*, *Phoma*, *Trichothecium roseum*, and *Cephalosporium* and incubated for 5, 10, and 20 days were investigated. During the first 10 days these fungi induced approximately equal losses in total weight; thereafter, *Alternaria*, *Cephalosporium*, and *Fusarium* continued a more vigorous rate of decomposition than the remainder. The various fungi appeared rather similar in ability to attack the constituents of hemp bark. During the first 5 days both polyuronide and pectin were substantially attacked, but there was little removal of cellulose until later. There was no indication that *T. roseum* is more destructive to cellulose and other plant constituents than any of the other fungi in pure culture. *Cephalosporium* apparently attacked cellulose slightly more than the other cultures.

Accumulation of sugars in barley seedlings on very acid soil, T. W. BARNES (*Nature* [London], 156 (1945), No. 3971, p. 692).—It had been noticed that seedling barley plants sown in soil too acid to allow normal growth were very much more attractive to small birds than similar seedlings grown on normal soil. From the data presented it seemed clear that there was a greater accumulation of sugar in both tops and seeds where the plants were grown in the very acid soil.

Alkaloid content of Ecuadoran and other American cinchona barks, W. E. MARTIN and J. A. GANDARA. (U. S. D. A. et al.). (*Bot. Gaz.*, 107 (1945), No. 2, pp. 184-199, illus. 8).—Though quinine is often thought of as the distinctive constituent of cinchona bark, the three other alkaloids quinidine, cinchonine, and cinchonidine were found commonly present—the last two in Ecuadoran barks often being greatly in excess of the quinine. Alkaloid ratio diagrams for the principal cinchona types are presented to show the relative composition of bark with respect to its alkaloid constituents; these diagrams appear to offer a simple graphic method of presenting genetic variability within a population and may be used as an aid in variety or species delimitation. The geographical distribution and approximate com-

position of the principal commercial cinchona barks of Ecuador are given, together with the comparative composition of other American barks.

Effect of various oxygen and carbon dioxide concentrations on cotton root development. O. A. LEONARD and J. A. PINCKARD. (Miss. Expt. Sta.). (*Plant Physiol.*, 21 (1946), No. 1, pp. 18-36, illus. 9).—The optimum concentrations for cotton seedling root elongation in nutrient solutions appeared to lie between 7.5 and 21 percent O_2 when CO_2 was constant at 10 percent. The greatest rate of root elongation for any 24-hr. period was 67 mm. in 21 percent O_2 and 10 percent CO_2 with the culture temperature at 30° C. The minimum O_2 requirement for cotton root elongation at 28° appeared to lie between 0.5 and 1 percent O_2 . Absence of O_2 around roots did not appear very harmful under the experimental conditions. When air containing 21 percent O_2 replaced N gas (no O_2), new branch roots were initiated and some of the old branch roots commenced to grow again. Root elongation was reduced by 90 or 100 percent O_2 ; roots produced under such conditions were readily parasitized by chytrids and *Fusaria*. Tap-root elongation at each O_2 concentration was similar whether nitrate or ammonium N was used in the culture solution. Vegetative growth appeared improved with the nitrate N; more nitrate N than ammonium N was taken up by the plants. The optimum concentration of CO_2 appeared to range between 0 and 15 percent when the O_2 concentration was maintained at 21 percent. The absence of CO_2 did not appear to affect root elongation. Concentrations of 60 percent CO_2 or over prevented all root growth and 30 and 45 percent CO_2 reduced it, the roots being rather thick. Shoot growth appeared uniform in both height and fresh weight at 0 to 30 percent CO_2 , reduced at 45 percent, and greatly reduced at 60 percent and above. The shoots frequently wilted at 60 percent CO_2 and above, especially in direct sunlight and with the temperature over 30°. It is concluded that cotton can withstand anaerobic soil conditions and that this ability is, perhaps, related to the translocation of O_2 from the tops to the roots.

Relationship of photoperiod and nitrogen nutrition to initiation of flower primordia in soybean varieties. N. J. SCULLY, M. W. PARKER, and H. A. BORTHWICK. (U. S. D. A.). (*Bot. Gaz.*, 107 (1945), No. 2, pp. 218-231).—In studying the effects of photoperiod and N nutrition on the expression of certain morphological characteristics of the soybean, the Morse, Virginia, Lincoln, and T-48 varieties were grown in controlled-environment rooms or the greenhouse and in either soil or sand cultures. Where N nutrition was not a factor, all flowered on all durations of the photoperiod, but first-flower primordia were formed at a higher node on the plant axis under the longer photoperiods. Position of first-flower primordia did not vary with N treatment when plants were grown under short photoperiods; under long photoperiods, however, plants of certain varieties initiated first-flower primordia at higher nodes as the N nutrition was increased, T-48 being outstanding in this respect, Lincoln intermediate, and Morse and Virginia least responsive. Lincoln and Morse plants grown under long photoperiods showed no effect of N concentration on the number of nodes bearing flower primordia. Effects were observed, however, in T-48 and Virginia, the number increasing with augmentation of N in Virginia but the reverse in T-48. The total number of nodes per plant increased with the N concentration when Lincoln, Morse, and Virginia were grown under photoperiods that delayed flowering; this was not true for T-48. There are 18 references.

Cytologie des zoospores de *Plasmopara viticola* Berl. et de Toni [Cytology of the zoospores of the grape downy mildew fungus], M. BOSC (*Compt. Rend. Acad. Sci. [Paris]*, 220 (1945), No. 12, pp. 407-409, illus. 1).

Cytological reactions induced by inorganic salt solutions, A. LEVAN (*Nature* [London], 156 (1945), No. 3973, pp. 751-752, illus. 1).—The author studied the immediate cytological effects on onion root tip meristems of salts—mostly nitrates—of some 40 metals in a dilution series of 10 to 16 concentrations and covering the whole range from total lethality down to strengths causing no distinguishable cytological effects. A rather striking result was the very common occurrence of the colchicine type of mitosis; in many cases the activity threshold was considerably lower than for colchicine itself. Several of the substances induced colchicine mitosis, which in morphological details and completeness was indistinguishable from the typical colchicine form. The colchicine-tumor reaction was rarely present when inorganic salts were used for inducing this form of mitosis. In exceptional cases sticky chromosomes resulted. Many of the salts caused deviations in the staining qualities of the chromosomes.

Chromosome number and morphology in *Nicotiana*.—VII, Karyotypes of fifty-five species in relation to a taxonomic revision of the genus, T. H. GOODSPEED (*Calif. Univ. Pubs. Bot.*, 18 (1945), No. 16, pp. 345-367, illus. 7).

Physical conditions of the surface of the mesophyll cell walls of the leaf, F. J. LEWIS (*Nature* [London], 156 (1945), No. 3962, pp. 407-409).—A brief summary of experiments with water, organic liquids, and emulsions and with the infiltration of the air space system under pressure with dyes.

Carpellary and placental structure in the Solanaceae, M. A. MURRAY (*Bot. Gaz.*, 107 (1945), No. 2, pp. 243-260, illus. 94).—Results of examination of the floral anatomy in 14 genera and 21 species of this plant family are presented.

A rapid histological technic for staining latex in roots of *Taraxacum kok-saghyz*, L. B. ABBE. (U. S. D. A. and Univ. Minn.). (*Stain Technol.*, 21 (1946), No. 1, pp. 19-22, illus. 1).—The freezing technic here described provides permanent slides of root sections of *T. kok-saghyz* with the latex preserved in place. The piece to be sectioned is pre-frozen before removal from the root, mounted in ice, and sectioned with a chilled microtome knife. The frozen sections are then plunged into the combination coagulant and stain prepared from Calco oil blue N. A., acetic acid, and ethyl alcohol, washed in water, aspirated if necessary, and mounted on a slide, using Karo. The technic is rapid and simple. The sections are well adapted to making counts and measurements of latex tubes, since the latex is retained in place by keeping the tissues frozen until introduced into the coagulant.

On sepal phyllody in roses and some related phenomena—experimental data and a quantitative interpretation, T. E. T. BOND (*New Phytol.*, 44 (1945), No. 2, pp. 220-230, illus. 6).—Cultivated roses in Ceylon frequently exhibit a condition of sepal phyllody consisting in the enlargement of the normal apical appendages of the sepal to form a leafy lamina up to 5 cm. long, the calyxes and flowers generally being otherwise normal. Continuous observation over 2 yr. indicated that the condition—though in part varietal—is controlled principally by the stage in development from pruning, being most in evidence thereafter during the first 5 weeks of flowering. The degree of leafiness in individual sepals—measured by their lamina lengths—decreased in a geometric series according to the position as determined by the two-fifth phyllotaxy, the outermost sepal being the most leafy and the innermost the least. This relationship applied equally to the normal and "leafy" calyxes, the average common ratio of the geometric series for roses of all four types examined being rather higher than 0.7. A similar "dilution" of the tendency to "leafiness" at successive plastochrons was demonstrated also from unpublished data for sepal phyllody of primroses in Ceylon and for the abnormal inflorescences resulting from smut infection in the grass *Elymus arenarius* in Britain. The findings are discussed in relation to the probable effect of hormones in controlling the vigor of growth and the balance between the normal reproductive and vegetative tendencies.

GENETICS

The principles of heredity, L. H. SNYDER (Boston: D. C. Heath & Co., 1946, 3. ed. [rev.], pp. 450+, illus. 156).—A revision (E. S. R., 76, p. 771).

The early history of the idea of the inheritance of acquired characters and of pangenesis, C. ZIRKLE (Amer. Phil. Soc. Trans., n. ser., 35 (1946), No. 2, pp. 91-151+).—A historical account, with an extensive list of references.

Yeast genetics: Life cycles, cytology, hybridization, vitamin synthesis, and adaptive enzymes, C. C. LINDEGREN (Bact. Rev., 9 (1945), No. 3-4, pp. 111-170, illus. 15).—This comprehensive review (83 references) takes up the genetics of yeast under life cycles, mating types, hybridization, cultural variability and stability, spores and sporulation, speciation in yeasts, cytology, budding, structure of the colony, dormancy, vitamin synthesis, and adaptation.

Symmetrical and asymmetrical reduction in ascomycetes, H. L. K. WHITEHOUSE and J. B. S. HALDANE (Jour. Genet., 47 (1946), No. 2, pp. 208-212).—In *Neurospora sitophila* and *Bombardia lunata*, asymmetrical postreduction was found more frequently than symmetrical postreduction. Thus, when a pair of allelomorphs *A* and *a* segregate, the orders *Aa Aa* and *aA aA* are more common than *Aa aA* and *aA Aa*. This was not the case with *N. crassa*.

Cytogeography of Emilia Cass. in the Americas, J. T. BALDWIN, JR. (But. Torrey Bot. Club, 73 (1946), No. 1, pp. 18-23, illus. 7).—*E. sonchifolia* and *E. coccinea* are widespread in the American tropics as introduced weeds; 14 collections of one and 7 of the other were examined. *E. sonchifolia* was found to be diploid ($n = 5$, $2n = 10$); *E. coccinea*, tetraploid ($2n = 20$). Though the species sometimes grow together, no indication of hybridity was found either in nature or in herbaria. The diploid matures quicker, is smaller, prefers a drier habitat, and has a less extensive north-south range than the tetraploid.

Hereditary forms of sterility in cattle: Biological and genetical investigations, I. K. ERIKSSON (Stockholm: Vet. Högsk., Meddel., 1944, pp. 1-155, illus. 10).—Sterility in cattle with special reference to single- and double-sided hypoplasia in bulls and heifers is described, including effects on morphological conditions and milk production. The relation of hypoplasia to apathy of bulls to mate and the effects of cystic ovaries in ♀♀ is noted. Hypoplastic cows had a higher fat content of the milk than normals, and with hypoplasia and cystic ovaries there was more milk produced of higher fat content. Inbreeding and relationship was high in the origin of the breed, but decreased and was the same for normal and hypoplastic bulls. Inbreeding was not intentional but was incidental to the limited breeding material. Hypoplasia came from two bulls. The three localized forms of hypoplasia—left, double, and right—occurred in the ratio of 82.1 : 14.5 : 3.4 in the two sexes. Non-genetic factors seemed to play a part in the appearance of these conditions. With the early breeding of Highland cattle and the small numbers, the frequency of hypoplasia increased to about 30 percent in 1935, but after this time with selection against it the frequency of the abnormality decreased to about 7.9 percent in 1942. The sterile double-sided hypoplast decreased to something over 1 percent. Although hypoplasia cannot be eradicated from Highland cattle within a reasonable time, it may be reduced by selection and breeding to such a low ebb that it may be of little consequence.

Sterility induced in growing rats on a tryptophane-deficient diet, W. F. KELLER (Univ. Md.). (Science, 103 (1946), No. 2666, p. 137).—In studies of various deficiency diets, it was found that no young were produced by rats receiving rations deficient in tryptophan. Albino rats ranging in age from 28 to 40 days were studied as to the effects of this deficiency. They produced no young on these rations even though observed to about 100 days of age, when all but one of the controls produced young.

Growing rats fed a diet lacking in tryptophan for as short a time as 3 days manifested sterility in both sexes. This amino acid, in addition to aiding in the synthesis of body proteins, had numerous other specific actions.

Plumage development in chickens, R. PENQUITE, R. B. THOMPSON, and V. G. HELLER. (Okla. A. and M. Col.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 13-19, illus. 6).—Over a period of years, observations were made on the feather character of several breeds of chickens with early feathering and colored varieties usually chosen. Various rations were fed. The plumage quality was often inferior when the bulk of a chick's ration was furnished by a single grain. Corn was more often responsible for the faulty condition than wheat or oats. "Rations low in protein produced faulty feathers. Dehydrated meat fed as a protein supplement gave better results than meat and bone meal, fish meal, casein, or plant proteins. A mixed source is superior to any single protein, although quality seems to be more important. The addition of natural sources of vitamins such as dehydrated alfalfa meal or yeast produces good feathers, but not unless the protein is reasonably high. The addition of single amino acids or vitamins was of little value so long as the proteins were deficient. The use of hormones—thyroid, stilbestrol, and chorionic gonadotropin—produced some favorable results even with the deficient rations. It is believed, however, that increased food intake and resulting increased growth were the determining factors." Low protein, deficient vitamins, fat, or crude fiber, or shock from physical conditions may cause abnormalities in feather form, color, barring, or growth. Poor feather development may result from any one of these conditions, but evidence seems lacking that any one may be considered a feather factor.

Pattern reversal in the plumage of thiouracil-treated hybrid fowl, M. JUHN. (Md. Expt. Sta.). (*Jour. Hered.*, 36 (1945), No. 12, pp. 354-356, illus. 1).—F₁ ♂♂ from Barred Rock × Brown Leghorn crosses had feathers with barred apices and Leghorn-like bases located among predominantly barred plumage. When such fowl were placed on a ration of 5 gm. of thiouracil per kilogram of dry feed, the regenerating feathers showed typical structural changes in fully barred feathers and in addition a complete reversal of pattern in Leghorn-like feathers, barring appearing in the thiouracil-modified basal section of these feathers. Thus, an altered metabolic level caused by thiouracil modified the phenotypic expression.

A study of the relationship between the iris color of the dam and the mortality of her progeny, R. F. BALL and R. K. COLE. ([N. Y.] Cornell Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 33-38).—An investigation of the relationship of the iris color of dams with round regular pupils to the mortality of their progeny was made and the data presented for over 500 dams and over 4,900 of their daughters. No significant relationship was found between the iris color of the dam and mortality of the daughters from all causes or from neoplasms. Iris color seemed to be of little value for differentiating resistant and susceptible strains of the two used.

Some observations on the oestrogenic induction of lactation in cattle, D. N. SPRIGGS (*Vet. Rec.*, 57 (1945), No. 47, pp. 519-525, illus. 3).—A copious lactation was initiated in a goodly proportion of maiden heifers and dry cows by subcutaneous implantation of solid tablets of various sizes of diethylstilbestrol or hexestrol. Milking was started 12 days after implantation. The optimum dosage of the hormones was obtained with fifty 50-mg. tablets implanted for more than 60 days. Certain changes in pelvic morphology were induced, and in one case of the 19 implanted a pelvic fracture was suspected as typical of the nymphomaniac condition. The normal estrus rhythm was frequently not restored until several months after removal of the tablets. Only 4 of 13 animals served became pregnant.

The cyclic changes of epithelial cords in the dog ovary, E. P. BARTON (*Jour. Morphol.*, 77 (1945), No. 3, pp. 317-349, illus. 27).—Observations of the histological changes in the ovaries of 32 dogs ranging in age from puberty to senility indicates

that the epithelial cords are the principal if not the only source of new germ and follicle cells in sexually mature dogs. The isolation of short epithelial cords from the germinal epithelium or the separation of parts of long epithelial cords that are near the surface of the ovary may result in the formation of spherical cell groups, the epithelial nodules, and anovular follicles. Anovular follicles appeared to be usually produced from epithelial cells and not by degeneration of oocytes within primary follicles. Any morphological or physiological condition which interferes with the development of the epithelial cords is favorable to the production of anovular follicles. Germinal epithelial activity and anovular or primary follicle formation is apparently correlated with the stage of the estrus cycle. The activity of the germinal epithelial, anovular, or primary follicle formation in a given ovary is therefore both continuous and rhythmical. Other details of ovum formation are described.

A criterion of luteal activity in the mouse, C. W. HOOKER (*Anat. Rec.*, 93 (1945), No. 4, pp. 333-347, illus. 12).—Observations on endometrial cells of 97 young adult ♀ mice of 8 inbred strains following injections of normal ovariectomized, pregnant, pseudopregnant, and lactating ♀♀ with progesterone, estrogen and progesterone, androgen, progesterone and testosterone, and desoxycorticosterone acetate showed that the nuclei were much larger after progesterone was injected or in the presence of functional corpora lutea. Estrogen administered in several forms had no effect on the stromal nuclei. Androgens provoked hypertrophy of lesser magnitude in the stromal nuclei than progesterone. The minimum effective daily dose of progesterone was 0.125 mg. with 3 days' treatment. No difference in strain response to progesterone was found.

The effect of colchicine on early cleavage of mouse ova, C. M. WALDO and W. A. WIMSATT (*Anat. Rec.*, 93 (1945), No. 4, pp. 363-375, illus. 7).—Cleavage of mouse ova in vivo was inhibited by doses of colchicine. Intraperitoneal doses of 0.10 cc. resulted in inhibition and fragmentation of tubal eggs. The smallest dose (1 : 32,000) inhibited less than 9 hr. without damage to the ova. Inhibition with the largest dose (1 : 4,000) lasted 16 to 20 hr., with probable destruction of the ova. The production of living fetuses was significantly reduced in mice given colchicine 1 : 8,000 intraperitoneally or 1 : 4,000 subcutaneously. None of the mice receiving colchicine 1 : 4,000 intraperitoneally produced living young.

A factorial experiment to learn the effects of four androgens injected into male chicks, G. W. SNEDECOR and W. R. BRENNEMAN (*Iowa State Col. Jour. Sci.*, 19 (1945), No. 4, pp. 333-342, illus. 2).—Results are given of an experiment on the response of male chicks to androgen injections, which included testosterone, testosterone propionate, dehydroandrosterone, and androstenedione. These were used alone and in all combinations of two, three, and four as compared with none. The experiment gave an opportunity to evaluate differential effects or interactions. From 10 to 13 chicks per treatment were used, and logarithms of comb and gonad weights were taken as criteria and adjusted by regression for differences in body weight. The method of unweighted means proved satisfactory in analysis of results in allowing for unequal subclass numbers. Gonad weight was depressed and comb weight increased by all treatments. Examples are given for calculation of the measure of the effect of main factors and interactions. The experiment failed to clarify some relationships of interest. Dosage levels may not have been the best factor. Some interesting interactions were found, but inconsistencies make average effects of doubtful value in many cases.

Semen production in Broad Breasted Bronze turkeys, J. E. PARKER (N. Dak. Agr. Col.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 65-68).—Active spermatozoa were found in semen collected from Broad Breasted Bronze toms in mid-December when they were 7 mo. of age and had not been exposed to artificial light. The semen volume and sperm concentration showed a marked increase the first 2 weeks the

♂ ♂ were exposed to artificial light. The number of sperm per collection increased to late March, followed by some decline thereafter. The average volume of semen collected was 0.33 cc., with an average density of 8.4 millions of sperm per cubic millimeter. The average number of sperm per ejaculate was 2.8 billions, with an average motility score of 3.9 on the basis of 0 to 5. Total quantities of semen produced by turkeys was less than half that produced by chickens, but sperm concentration was more than twice that produced by cocks.

The ovarian cycle of the ring dove (*Streptopelia risoria*), N. L. CUTHBERT. (Wis. Expt. Sta.). (*Jour. Morphol.*, 77 (1945), No. 3, pp. 351-377, illus. 7).

FIELD CROPS

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 11, pp. 1, 2, 8, illus. 4).—Certain progress results from agronomic experiments are reported in articles entitled Nitrogen the Basis of Profitable Oat Yields, by R. Coleman (pp. 1, 8), and Restoring Wasteland to Productivity With Kudzu (p. 2).

Results of small grain variety tests, 1945, R. P. MOORE (*Res. and Farming [North Carolina Sta.]*, 4 (1945), *Prog. Rpt.* 1, pp. 9-10, illus. 1).—Varietal recommendations based on continued tests are for the mountain section—Thorne wheat; Letoria and Stanton oats; Davidson, Tenn. Winter, Tenn. 6, and Sunrise barley; Piedmont—Hardired wheat; Lemont, Stanton, and Letoria oats; and Sunrise barley; and Coastal Plain—Hardired wheat, Stanton oats, and Sunrise barley. Rye tests were too limited for recommendations.

Sudan grass, millets, and sorgums in Oregon, H. A. SCHOTH and H. H. RAMPTON. (Coop. U. S. D. A.). (*Oregon Sta. Bul.* 425 (1945), pp. 27, illus. 6).—Practical information, based on extensive experimentation, is given on the adaptations, cultural requirements, control of diseases, insects, and other pests, seeding methods, uses for hay, seed, soiling and silage, and pasture, and place in crop rotation of Sudan grass; proso, foxtail, and Japanese barnyard millets; and sorgo and grain sorghums.

The 1945 official Virginia varietal tests of corn hybrids, barley, oats, and wheat, M. H. McVICKAR and T. M. STARLING (*Virginia Sta. Bul.* 383 (1945), pp. 16, illus. 1).—Report is made again on acre yields and other agronomic characters of corn hybrids and varieties grown in performance tests (E. S. R., 93, p. 34) at 16 places and also on varieties of barley, wheat, and winter and spring oats grown in tests at 6 places in Virginia in 1945. Corn hybrids and small grain varieties are recommended for each of 7 general sections of the State.

Effect of variety, location, and season on oil, protein, and fuzz of cottonseed and on fiber properties of lint, O. A. POPE and J. O. WARE (*U. S. Dept. Agr., Tech. Bul.* 903 (1945), pp. 41, illus. 1).—Studies on samples from 16 varieties of cotton grown at 11 to 14 locations 1935-37 dealt with the relative effects of varieties, locations, and seasons, and the interactions of these main effects on oil and protein content of cottonseed, amount of fuzz on the seed, and on the various fiber properties.

Comparatively wide differences were identified in each year among locational means and varietal averages for all of the variables. The rank of varieties was relatively consistent for the different locations and seasons in average percentage of oil, protein, fuzz, fiber length, and fiber maturity. The order or rank of station averages, however, varied widely among years for all variables, indicating that ecological effects depend largely on weather conditions during the growing season and comparatively little on the soil series or types represented. Percentages of oil and protein were substantially independent among the varieties, but were negatively associated when effects of environment were considered. Length and weight per

inch of fiber depended largely on the genetic constitution of varieties, although growth conditions exerted rather important effects. Tensile strength and percentage of immature fibers were largely dependent on growth conditions, although definite varietal differences were identified.

In all the fiber properties studied it was definitely evident that the genetic constitution of varieties is the most important controllable factor. Consequently, fiber characteristics should be carefully examined in any breeding program, so that those that contribute to the quality of the manufactured product may be associated with desirable yield factors in the development of new strains and varieties. It was also clear that oil, protein, and fuzz are all dependent on genetic constitution, and that a consideration of these variables in the breeding program should result in the isolation of lines superior in any one or all of the characteristics.

Sericea as a soil-improving crop for corn, C. A. MOOERS and B. P. HAZLEWOOD (*Tennessee Sta. Bul.* 197 (1945), pp. 12, illus. 2).—Corn yields the first year (1933) after 3 yr. or longer of *Lespedeza sericea* sod on depleted Lintonia silt loam at Jackson was turned under averaged 69 bu. per acre (adjusted), and in succeeding years 64.6, 57.5, 50.7, 43.6, 39.4, 35.6, 33.8, 29.8, 28.1, and in the eleventh year 26.6 bu. compared to 17.5 bu. (8.6 to 28.2) for continuous corn 1933–43. Analysis of the mulch material and of 1-in. soil layers beneath indicated an increase of N 750 lb. per acre attributable to the sericea over 15 yr. The extra N supply appeared ample to account for continued production for 6 yr. of corn crops exceeding 40 bu. per acre. The soil was well supplied with P.

Since annual removal of large sericea crops might give rise to K deficiency for corn, yearly (1939–43) applications of KCl 50 lb. per acre were compared with adjoining no K plots. In every case, no increase in yield was obtained for first-year corn, while the increase of second- and third-crop corn always averaged nearly 6 bu. per acre. The increase declined sharply from the fourth to the seventh year and dropped to 0 for the ninth to eleventh crops. Failure of K to increase the first-year crop was attributed to K in the mulch material plowed under, adequate for the first crop but not for the large second and third crops, averaging with K nearly 68 bu. per acre. Final disappearance of K effect suggested that the natural K supply in the soil was adequate for yields up to about 35 bu. per acre.

A practical inference is that sericea ordinarily leaves an appreciable N residue even when subject to annual crop removal. Medium to poor land in high-yielding sericea for 3 or more years can be expected to produce large yields of corn for several successive years, but attention should be given to the possible K and P needs of the soil.

Alta fescue production in Oregon, H. H. RAMPTON. (Coop. U. S. D. A.). (*Oregon Sta. Bul.* 427 (1945), pp. 22, illus. 6).—The adaptation, characteristics, cultural and harvest methods, utilization (including pasture mixtures), and management of Alta fescue and its pests are described from experiments since 1932. An improved strain of tall fescue, it is longer lived than meadow fescue and is a better producer of forage. Its widespread popularity in Oregon is due chiefly to excellence in pastures, and its features are high yields of palatable forage, long growing season, deep roots that allow the plant to utilize deep subsoil moisture for green growth throughout the summer, wide adaptations, and long life. It is generally adapted for forage where annual rainfall is 15 in. or more and below 5,000 ft. elevation, and for seed with least 18 in. of annual rainfall and an elevation not above 3,000 ft. Adapted to heavy lands, tolerating poorly drained conditions and moderate alkali concentrations, and thriving on quite acid soils, Alta fescue is an excellent soil improver because of organic matter supplied by the root system. The crop needs plenty of fertilizers, especially N, clean seedbeds, weed-free seed, and cultivated rows for best quality and high yields of seed.

Sheyenne flaxseed for sowing in 1946, T. E. STOA (*North Dakota Sta. Bimo. Bul.*, 8 (1945), No. 2, pp. 7-8).—Seed of Sheyenne flax (E. S. R., 93, p. 429) was expected to be available for planting on about 20,000 acres in 1946. Characteristics and performance of the variety are described briefly.

Breeding experiments promise better oats for New York, H. H. LOVE. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, p. 18, illus. 1).—Goldwin oats, a variety highly resistant to races of smut found in New York and developed in the Cornell breeding program, has yielded an average of about 16 percent more than Cornellian and Lenroc developed earlier. Rust-resistant varieties are also in the process of development.

Beet seedballs vary widely in size and weight: Smallest seed has greatest bushel weight but lowest viability—germination increased by resizing seed-stocks, W. CROSIER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, pp. 15, 17).—Removal of the smaller, heavier, low germinating beet seed balls resulted in marked improvement in viability and inferentially in greater uniformity of stand. Neither weight per bushel nor per 1,000 seed bore any relationship to viability. See also a note by Lynes (E. S. R., 94, p. 194).

Fertilizers for sugar beets on some California soils, R. A. PENDLETON and W. W. ROBBINS. (Coop. U. S. D. A.). (*California Sta. Bul.* 694 (1945), pp. 26).—When placed either in contact with sugar beet seed or in close proximity in greenhouse tests with Yolo loam, all N-carrying fertilizers strongly depressed germination of the seed balls. P fertilizers depressed germination somewhat less, but were injurious. One inch of soil separating seed from fertilizer was insufficient for protection. Seed planted $2\frac{1}{2}$ in. deep germinated only 30 percent as well as that planted $1\frac{1}{2}$ in. deep. In field experiments on mineral soils of the Yolo, Sacramento, Columbia, and Conejo series, N was the only fertilizer that improved production of beets. Increases in yields ran from 10 tons per acre down to nothing, according to the degree of depletion of the natural soil fertility. Sucrose percentages were only slightly depressed by moderate amounts of N fertilizers. Yields could generally be improved on soils of the Ryde series by use of P fertilizer, and often additional improvement might result from liming. No benefit came from P or K for sugar-beet production on muck and peat soils such as the Egbert, Staten, or Venice series. Where growth on these soils was depressed from a N shortage, yields were improved by use of N fertilizers. No fertilizer practice seemed of benefit where an excessive supply of available soil N caused an unnatural growth, with greatly depressed sucrose synthesis. A change in rotation practice is suggested as a possible remedy.

Tobacco seedbeds, J. JOHNSON and W. B. OGDEN (*Wisconsin Sta. Bul.* 467 (1945), pp. 28, illus. 22).—Early plant production, selection of the seedbed early in September, preferably with a southern or eastern exposure and other favorable site conditions, use of suitable old locations, fall steaming, formaldehyde soil drench, reduction of weeds by cyanamid treatment, spring seedbed preparation, caution in use of fertilizers, better spring steaming, use of reliable seed sown at rate of 1 oz. to 10 to 12 (running) rods of seedbed, a planting date to yield satisfactory plants, care in sanding of seedbed, good seedbed covers, proper watering, control of diseases with new Cu compounds, control of insect pests, treatment with nitrate solution to hasten growth, and hardening plants before transplanting are some of the practices described as useful in growing strong healthy tobacco plants. Faulty methods in use are pointed out, and the advantages of the new treatments are discussed.

Tobacco plant-bed management, R. G. HENDERSON, E. M. MATTHEWS, and W. A. JENKINS (*Virginia Sta. Bul.* 384 (1945), pp. 12, illus. 8).—Practices recommended to aid farmers in growing better tobacco plants include selection of the site for the plant bed, size and shape of the bed, use of old plant-bed sites, chemical

treatment of soil for weed control, fertilization and seeding, plant-bed covers, avoiding introduction of diseases, and control of blue mold and insects.

Increase of wheat yields resulting from modern breeding methods, L. R. WALDRON (*North Dakota Sta. Bino. Bul.*, 8 (1945), No. 2, pp. 14-16).—Each successively introduced new wheat variety resulted in larger yields between the years 1916-45. The gain over the original Power in bushels due to introduction of varieties bred for performance averaged 6.9 bu. at Fargo, or about 3.5 bu. on the farm in North Dakota.

Seed inspection in Kentucky, 1944-45, W. A. PRICE, M. L. DIDLAKE, E. C. VAUGHN, E. DEEN, H. TILSON, A. MCDANIEL, M. MORTON, M. L. LITTELL, L. BAUGH, and C. CUNDIFF (*Kentucky Sta. Regulat. Ser. Bul.* 45 (1945), pp. 36).—Purity and germination percentages and, when present, excessive quantities of noxious weed seed are reported for 542 official samples of farm crop seed obtained from dealers during the year ended June 30, 1945.

Legume inoculant tests for 1945, A. W. HOFER. (N. Y. State Expt. Sta.). (*Farm. Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, p. 10).—Tests of 46 commercial cultures for inoculation of alfalfa, clover, peas, beans, soybeans, birdsfoot trefoil, and mixed cultures for garden use are reported.

HORTICULTURE

Vegetable varieties: New and improved, P. WORK. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, p. 6, illus. 1).—Brief descriptions are presented for a number of new beans, peppers, eggplants, rutabagas, squash, and tomatoes which have been tested at Ithaca, N. Y. Most of the varieties mentioned are products of breeding studies by various State experiment stations.

1945 vegetable seed measured up, S. R. PATRICK. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, pp. 19-20).—Germination tests of packet seed showed that over half of the guaranteed figures were approximately correct and 87 percent of the samples germinated above the federal standards set for vegetable seeds. Nearly 11 percent were below the standard, and of these less than 1 percent were unfit for planting. Weed seeds representing 38 species were found in 112 of the samples tested.

Rodfrugternes sygdomme og skadedyr [Diseases and pests of root crops]. E. GRAM and P. BOVIEN (*København (Copenhagen): K Danske Landhush. Selsk.*, 1944, 2. ed., pp. 125, illus. 56).—A handbook on the diseases and insects affecting root crops and their control. There are 48 colored plates.

Hop spray schedule revised, R. O. MAGIE. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, pp. 10-11, 20).—Information is presented on the spraying of hops, with particular reference to the control of downy mildew and aphids. In spite of highly unfavorable weather conditions in 1945 Brewers Gold, Bullion, and certain station seedlings produced a good crop without protection from mildew and aphids.

English pea variety trials, Crystal Springs, J. A. CAMPBELL, E. L. MOORE, and H. H. FOSTER (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 11, pp. 1, 8).—Of eight varieties of garden peas tested over a period of 3 yr. at the Truck Crops Branch Station, Thomas Laxton was the highest yielding variety of the shipping types. Another variety, known as No. 301, was somewhat more productive, but the light green color of the pods rendered it unsuitable for fresh market trade. Wando, a new variety developed by U. S. Regional Vegetable Laboratory at Charleston, S. C., produced an autumn crop, whereas Thomas Laxton planted for comparison yielded practically nothing. Wando ripened its spring crop 10-12 days later than Thomas Laxton.

Tomato variety test, Poplarville, 1944-45, T. E. ASHLEY (*Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 11, pp. 1, 8*).—Among several important varieties tested at the South Mississippi Branch Station, Rutgers, Stokesdale, and Marglobe were outstanding with respect to percentage of the crop that was rated as marketable. The plants were pruned, tied, and staked according to the commercial practice in the area.

Plant growth under controlled conditions.—VI, Comparison between field and air-conditioned greenhouse culture of tomatoes, F. W. WENT and L. COSPER (*Amer. Jour. Bot., 32 (1945), No. 10, pp. 643-654, illus. 10*).—With a view to determining whether night temperatures play as important a role in tomato growth under field as under greenhouse conditions (*E. S. R., 94, p. 470*), five tomato varieties were grown in eight localities in southern California. By making three to five separate plantings at monthly intervals, a further climatic differentiation was attained. It was found that the growth rate of stem elongation, when plotted against mean minimal temperature during the measuring interval, followed closely the growth rate of the same variety in the greenhouse. This held true irrespective of the locality or the time of year, showing that night temperature was the main factor controlling stem growth rate.

Fruit production differed greatly according to variety, locality, and time of planting. No correlation was found between the maximum temperatures and the amount of fruit ripening.

Marked fluctuations in fruit production, especially in the Stone and Beefsteak varieties, were correlated with high minimal night temperatures occurring 1 mo. before ripening. In the Earliana, which sets at lower night temperatures in the greenhouse, no such correlation was observed. Only under optimal growing conditions was the period of time between planting and harvesting typical.

Effect of field spacing on yields of cannery tomatoes, C. B. SAYRE (*N. Y. State Expt. Sta.*). (*Farm Res. [New York State and Cornell Stas.], 12 (1946), No. 1, pp. 12-13*).—The outstanding feature of spacing studies was that there was no significant difference in yield per acre whether the tomato rows were 4, 5, or 6 ft. apart or plants set 4, 3, or 2.5 ft. apart in the row, provided the number of square feet allotted each plant was the same. However, as the number of square feet per plant was increased above 16, there were significant decreases in acre yields. The plowing under of fertilizer with a rye cover crop increased yields markedly.

Pomologi, I, II [Pomology, I, II], C. G. DAHL (*Stockholm: Alb. Bonniers Boktr., 1943, 2. ed., vol. I, pp. 300, illus. about 305; vol. II, pp. 390, illus. about 330*).—Presented in two volumes, the first of which is devoted to apple varieties and the second to pears and plums, this profusely illustrated treatise presents historical, descriptive, and other information on the more important varieties grown in Sweden.

Fruit Breeding Farm report for 1945, W. H. ALDERMAN and F. E. HARALSON [*Minn. Expt. Sta.*]. (*Minn. Hort., 74 (1946), No. 1, pp. 3, 12-13*).—Severe scab infection due to long-continued cool, wet weather afforded a critical test of resistance in apple varieties. Many of the hybrid crabs displayed almost complete resistance. Among standard apples, Minjon was outstanding for its freedom from scab on the fruit. Haralson, Wealthy, and Prairie Spy proved very susceptible. A large number of hybridizations of plums, sandcherries, sweet and sour cherries, and apricots were made in the greenhouse, and considerable work was done in the open with strawberries, raspberries, grapes, and apples.

Promising results were obtained in plum improvement with several varieties of the European type demonstrating a considerable degree of hardiness and merit. Due to the relatively mild winter of 1944-45, many of the peach seedlings came through with partial to full crops of fruit.

Most of the hardy peach seedlings are of small size, have white flesh, and mature late. A considerable number of promising seedlings (now carrying numbers) of various species are listed as about ready for introduction and possible naming.

Preharvest apple drop, with special reference to McIntosh, L. P. LATIMER (*New Hampshire Sta. Bul. 355 (1945), pp. 23, illus. 4*).—Presented with the problem of an important commercial variety of apple that has the habit of dropping frequently a considerable portion of its fruit prior to desirable maturity, the station investigated the effect of soil type, root growth, size of crop, and various chemical sprays on fruit drop. Although heavy- and light-dropping McIntosh trees appeared to be more or less segregated in the orchard, differences in soil profile, root distribution, or number of roots could not be associated with dropping tendency except that small roots were more numerous in the lower levels of the soil under the heavier dropping trees. There was some evidence that heavy-dropping trees were on slightly more acid soil than were light droppers, but no difference in available N, K, Mg, or Ca in the soil could be associated with dropping tendencies. Phosphorus was slightly higher under the lighter droppers.

Variations in correlation between percentage drops and yields from year to year were large. Very high correlations were found between the total weight of drops and yield over a period of years. Thinning of fruit did not have consistent effects in reducing dropping.

Spraying trees with borax retarded dropping to an appreciable extent. Variability in the response of McIntosh trees sprayed with naphthaleneacetic acid led to the conclusion that this material does not always delay fruit dropping. On the other hand, fruit dropping of Melba, Early McIntosh, Gravenstein, and Milton was definitely retarded by naphthaleneacetic acid.

Seed number was slightly higher in early drops than in those dropping near the regular time of harvest. However, dropped apples averaged one to two less seeds than those picked from the tree at harvesttime. The early-dropped apples colored apparently in advance of those which remained on the tree until regular harvest.

Use of growth-promoting substances in the prevention of apple drop following frost, T. SWARBICK (*Nature [London], 156 (1945), No. 3971, pp. 691-692*).—A severe spring frost which occurred at the Long Ashton (England) Research Station, when most of the apple blossoms had set and the small fruits were beginning to develop, killed the embryos and blackened the centers of all the fruits. With a view to ascertaining whether parthenocarpic development could be induced, two varieties, Miller Seedling and Coxorange Pippin, were sprayed with a mixture of several chemicals, namely, β -indolebutyric acid, α -naphthaleneacetic acid, 2,4-dichlorophenoxyacetic acid, and β -naphthoxyacetic acid at 5, 5, 5, and 60 p. p. m., making a total hormone concentration of 75 p. p. m. Within 14 days almost every fruit had dropped from check Miller Seedling trees whereas none had fallen from the sprayed trees. The small fruits began to swell and developed into good-sized seedless apples. The spray had no effect whatsoever on the Coxorange Pippin variety. Neighboring Miller Seedling trees which received only the spray drift set a fair crop, indicating that a much lighter spray than that applied might have been adequate to induce parthenocarpy.

Calville Blanc apple rich in vitamin C, G. H. HOWE. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 12 (1946), No. 1, p. 5*).—Among apple varieties and seedlings tested for vitamin C content, the Calville Blanc had the highest value of all tested with an average of 37 mg. per 100 gm. of weight. Most of the commercial varieties ranged below 15 mg.

Calville Blanc is described as unattractive in appearance and mediocre in quality, but desirable as a parent for the development of new varieties rich in vitamin C.

The one tree of Calville Blanc in the station orchards is believed to be the only one existing in the United States.

The identification of pear varieties from non-bearing trees, L. SOUTHWICK, A. P. FRENCH, and O. C. ROBERTS (*Massachusetts Sta. Bul. 421, Sup. (1945), pp. 2, illus. 1*).—This supplement to the earlier noted bulletin (E. S. R., 93, p. 290) contains a technical description of the Waite pear tree based on 1-yr. whips and 2-year-old trees. The Waite pear described in the original paper was found later to have been incorrectly named.

Oxygen deficiency in the winter flood of cranberry bogs, H. F. BERGMAN. (U. S. D. A.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Conv., 76 (1945), pp. 7-13, 16*).—The subject is presented from the standpoint of needs of the cranberry plant for oxygen, factors affecting the dissolved oxygen content of water, conditions under which injury occurs from a lack of sufficient oxygen, forms of injury, and remedial measures.

Elderberry culture in Ohio, W. P. JUDKINS (*Ohio Sta. Bimo. Bul. 237 (1945), pp. 187-189*).—The elderberry is described as to plant characteristics, growth requisites, cultural requirements, propagation, uses, etc.

Brazil's oil-yielding palms, M. L. BOMHARD (*U. S. Dept. Agr., Agr. in Americas, 6 (1946), No. 1, pp. 6-9, 14-15, illus. 6*).—Nearly 500 species out of a total of perhaps 1,250 palms native to the Americas occur in Brazil. Many of these are of the oil-yielding type and aid in supplying vegetable oils. The author discusses the industrial importance of Brazil's oil-yielding palms, uses of the oil, some of more important species, and their habits of growth and fruiting. In addition to native species, the coconut palm and the African oilpalm are grown and appear to have become naturalized in some areas.

Effects of iron on certain nitrogenous fractions of *Ananas comosus* (L.) Merr., C. P. SIDERIS and H. Y. YOUNG. (Pineapple Res. Inst. Hawaii). (*Plant Physiol., 21 (1946), No. 1, pp. 75-94, illus. 6*).—This paper is concerned with the effects of plus-*v.* minus-iron cultures in association with those of ammonium or nitrate nitrogen on the nitrogenous fractions of the tissues of the pineapple. The plants grown in the ammonium series contained greater amounts of total N than those in the nitrate N series. The leaves and stem, but not the roots, of the plants of the plus-Fe cultures in the ammonium-N series contained slightly greater amounts of total N than of the minus-Fe series. The differences in total N between the plus- and minus-Fe series were greater in the nitrate- than ammonium-N series and were in favor of the former cultures.

The amide- and amino-N contents of the tissues were greater in the ammonium- than in the nitrate-N series. The results indicate that the primary products of ammonium assimilation were amide- and amino-N compounds and suggest that protein synthesis in plants supplied ammonium N is via these compounds. In the case of nitrate-supplied plants, protein synthesis was apparently different than in the ammonium series.

Statistically significant differences were obtained in the amounts of organic-N, peptide-N, basic-N, and proteose-peptone-N between the plus- and minus-Fe cultures of the nitrate N series which were in favor of the plus-Fe cultures. In the ammonium-N series such differences were observed only in the organic-N and protein-N fractions. In the ammonium-N series, basic N was the only fraction highly significant in favor of the minus-Fe cultures.

Vanilla-bean production and trade, H. B. WHITMORE (*U. S. Dept. Agr., Foreign Agr., 10 (1946), No. 1, pp. 11-16, illus. 4*).—A popular article setting forth the history of vanilla production and use, source of supplies, imports into the United States, development and use of the artificial vanilla extract called vanillin, outlook for 1946, etc.

The lack of scion effect on root quality of *Derris elliptica*, M. A. JONES and W. C. COOPER. (P. R. Fed. Expt. Sta.). (*Plant Physiol.*, 21 (1946), No. 1, pp. 63-67).—With a maximum yield of root of uniformly high rotenone content as a goal, an investigation was undertaken to determine if grafting a variety of relatively high rotenone content on a vigorous growing root of relatively low content might influence the rotenone production in the roots. Reciprocal grafts were made in the hope of increasing the amount of roots on the less vigorous but higher rotenone stock.

Studies of the roots of the resulting plants failed to show any effect of the scion on the yield of roots or on their rotenone content. The results suggested that the root system is not dependent on the top for a precursor of rotenone, and that the synthesis of rotenone is apparently confined principally to the root system of the *D. elliptica* plant.

An electrometric method for defining the area of bark affected by tapping *Hevea brasiliensis*, D. G. WHITE. (P. R. Fed. Expt. Sta.). (*Plant Physiol.*, 21 (1946), No. 1, pp. 102-108, illus. 2).—Modern tapping methods utilize at times two cuts on a single tree, and there may be reciprocal interference. There occurs often a physiological disorder known as brown bast which is attributed to over tapping and may be the result of placing cuts too near to one another. An electrometric method based on measurements with a Bouyoucos bridge of the resistance of bark tissues to an electric current is described. The readings revealed the area of bark below the tapping cut that were affected by the tapping. The effects of tapping a low-yielding seedling tree with a half-circumference cut were found measurable to a distance between 18 and 24 in. below the cut. The need of extending the observations to high-yielding clonal trees in a high state of production is stressed.

Culture and forcing of greenhouse azaleas, A. LAURIE and D. C. KIPLINGER (*Ohio Sta. Bimo. Bul.* 237 (1945), pp. 177-187, illus. 2).—Brief information is presented on the propagation, growing, forcing, and protection of azalea plants. Acid peat is recommended as the most suitable growing medium for azaleas when the soil is alkaline or its structure not suited for growth of the root system. Mixtures of soil and acid peat were not satisfactory. Regular applications of ammonium sulfate and of iron sulfate are necessary to promote growth and to prevent chlorosis, respectively. In June plants may be taken outdoors and grown under lath or cloth screens. In early August, the cover should be removed to encourage development of flower buds. In September the plants should be returned to a frost-proof frame or cool greenhouse. Plants designed for early forcing should be subjected for 4 weeks to 45° F. in a well-lighted situation. Data are presented on the response of several varieties to various forcing treatments.

New Minnesota garden chrysanthemums, L. E. LONGLEY. (Minn. Expt. Sta.). (*Minn. Hort.*, 74 (1946), No. 1, p. 13).—Two new varieties of garden chrysanthemums developed by the station, namely, Dee Dee Ahrens and Violet, are described.

Nitrogen nutrition for roses, J. G. SEELEY. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, pp. 8-9, illus. 1).—Results of a study in progress at Ithaca, N. Y., since 1940 suggest an optimum nitrate range for rose soils of 25 to 100 p. p. m. In the case of Better Times roses grown at levels of 10, 25, 50, 75, and 100 p. p. m., production increased with each increment. Over the 3 yr. of the the experiments average production per plant for a 11-mo. cutting season ranged from 29 blooms for the lowest to 34 blooms for the highest nitrate level. No significant differences in stem length could be associated with nitrate level. Briarcliff roses grown in soil maintained at 50, 100, 200, 300, and 400 p. p. m. suffered from chlorosis at the 300 and 400 p. p. m. Light was a factor in rose production, as shown by the fact that at all nitrate levels production was lowest in the winter months.

FORESTRY

Forests and employment: Report of the Chief of the Forest Service, 1945. L. F. WATTS (*U. S. Dept. Agr., Forest Serv. Rpt., 1945, pp. 35+*).—This, the regular annual report (*E. S. R.*, 92, p. 661), contains information on the general forestry situation of the nation and in particular on the activities of the Forest Service in administering the national forests and promoting the more efficient use of privately owned forest areas. Among items considered are forest and range management, forest protection, forests as an aid in flood control, relation of forests to national welfare, need of increased research on silviculture and forest products, war activities, etc.

Looking ahead in forestry. P. W. SCHOEN (*Tex. Acad. Sci. Proc. and Trans.*, 28 (1944), pp. 155–157).

The Yale forest in Tolland and Windham Counties, Connecticut. W. H. MEYER and B. A. PLUSNIN (*Yale Univ. School Forestry Bul.* 55 (1945), pp. 54+, *illus.* [21]).—In presenting a general description of the area, the authors review its history since settlement, population movements, organization of the tract as a college property, environmental conditions, results of the 1938 hurricane, present composition and condition of the tree cover, etc.

Forest plantations in northern Minnesota. E. G. CHEYNEY. (*Univ. Minn.*) (*Jour. Forestry*, 44 (1946), No. 1, pp. 39–40).—A study of 110 coniferous plantings made in northern Minnesota in the preceding 15 yr. showed that plantations on old fields which had been under tillage were usually successful irrespective of species used. Recent burns ranked next to abandoned fields as favorable sites. A heavy burn which had destroyed all the brush appeared better than lighter burns. Light sandy soils too poor to support a dense stand of brush were also favorable.

An unbroken stand of hazel presented one of the most difficult handicaps to reproduction, natural or planted. Hazel responded to cutting or burning with dense growth and in addition offered a haven to rabbits, but may be suppressed by repeated disking and possibly by planting balsam fir, which seemed to be the only forest species capable of pushing upward through hazel undergrowth. Deer and rabbits, particularly the latter, are a positive menace to plantations and must be controlled.

Forest tree breeding and genetics. R. H. RICHENS (*Imp. Agr. Bur. [Gt. Brit.], Joint Pub.* 8 (1945), pp. 79+; *Ger., Fr., Span. abs.*, pp. 63–64).—Beginning with a brief discussion of the general principles involved in the improvement of forest species by selection and breeding, the author reviews briefly the work reported since 1930. The arrangement is by soft and hardwoods, each arranged alphabetically by species. In addition to British Empire and United States activities, the author includes many references to the less accessible literature from Russian, Swedish, and German sources.

Determination of the regulated empirical growing stock from field data. A. W. GOODSPEED. (*Iowa State Col.*) (*Jour. Forestry*, 43 (1945), No. 12, pp. 908–914, *illus.* 3).—Existing formula methods of computing regulated empirical growing stock are believed inherently unsound because of the assumption that increment in even-aged stands is laid on in equal annual amounts. A cubic, or third-degree equation, is believed to represent more closely the volume development of a forest stand than can the straight line implicit in existing formula methods. The author develops a more accurate method for determining the growing stock by use of a fourth-degree equation.

A numerical evaluation of stand structure. A. M. HERRICK. (*Ind. Expt. Sta.*) (*Jour. Forestry*, 43 (1945), No. 12, pp. 891–899, *illus.* 6).—Employing the original conception of the structure of a stand, the author suggests a technic whereby stand structure may be numerically defined and utilized in forest management. Just as

site index is a single, quantitative expression of the factors that make up site quality, the stand-structure factor characterizes the arrangement of the trees constituting a forest stand.

Response to release of sugar maple, white oak, and yellow-poplar, A. A. Downs. (U. S. D. A.). (*Jour. Forestry*, 44 (1946), No. 1, pp. 22-27).—Records taken in permanent study areas in 7- to 14-year-old stands of sugar maples on the Monongahela National Forest, West Virginia, and white oaks and yellow poplar on the Jefferson National Forest, Virginia, showed that the response to release cuttings varies with species, degree of release, vigor of trees, and crown class. Release tended to stimulate diameter growth in all crown classes and height growth in the lower crown classes when vigor was not poor. Sugar maples responded most and yellow poplar the least. Response was greater for diameter than for height growth, tended to be greater for heavy than for light release, and within a given crown class increased with better vigor. Weeding is recommended for medium- and good-vigor trees, but not for poor-vigor trees. Because of favorable response in sugar maple, thinning of sapling stands is recommended even before the trees are large enough to pay for the operation. Thinning from above in sugar maple and white oak is deemed feasible because medium-vigor codominant and intermediate trees respond favorably to release.

Response of Allegheny northern hardwoods to partial cutting, A. F. Hough and R. F. Taylor. (U. S. D. A. et al.). (*Jour. Forestry*, 44 (1946), No. 1, pp. 30-38, illus. 6).—Studies on the Kane Experimental Forest in northwestern Pennsylvania showed that in an even-aged, mixed hardwood stand, including a few older beech and hemlock trees, cutting 38 percent of the basal area in 1933 when most of the trees were 40 yr. of age resulted in the next 10 yr. in an annual increment of 1.73 cords per acre. At the same time, the uncut check area grew 1.02 cords per acre per year. In addition the partially cut stand was improved by removal of crooked and disfigured trees. In a glaze storm in 1936, the cut stand suffered more than the check area, except for black cherry, the tops of which were exposed in both stands. Partial cutting lowered the mortality rate of most species, especially of sugar maple and beech under 8 in. in diameter at breast height. Diameter increment was greater in the larger trees, because of their generally greater vigor. Black cherry needed to keep its crown in the open or growth was depressed. Sugar maple and beech withstood suppression and grew rapidly upon release. A method for predicting stand growth is suggested.

Pinus: A contribution of turpentine chemistry to dendrology and forest genetics, N. T. Mirov. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry*, 44 (1946), No. 1, pp. 13-16).—Most of the world's supply of turpentine is said to be obtained from slash, longleaf, and French maritime pine. The turpentine of these three species is of relatively simple chemical composition, consisting mainly of two terpenes, alpha-pinene and beta-pinene. The author discusses the chemistry of the product of other species, suggests how the composition might be useful in species identification, and discusses the composition of the turpentines of hybrids. Of the pines examined, only Jeffrey and Digger had almost identical turpentines. In *P. ponderosa*, different strains had somewhat different composition.

Longleaf pine—its use, ecology, regeneration protection, growth, and management, W. G. Wahlenberg (Washington, D. C.: Charles Lathrop Pack Forestry Found., 1946, pp. 429+, illus. 123).—Prepared by a member of the staff of the Southern Forest Experiment Station of the U. S. D. A. Forest Service, this comprehensive monograph assembles and interprets pertinent information regarding this important species. The book is designed to be of use to research workers, students and teachers of forestry, and in the longleaf pine belt to forest managers handling regeneration.

Growth of ponderosa pine by Keen tree class, C. MILES. (U. S. D. A.). (*Jour. Forestry*, 43 (1945), No. 12, pp. 905-907).—The author presents and analyzes sample plot data from the Boise and Salmon National Forests in support of his belief that the Keen tree classification provides a reliable guide for the marking of ponderosa pine stands in southwestern Idaho.

Virginia pine in Iowa, A. L. McCOMB. (Iowa State Col.). (*Jour. Forestry*, 44 (1946), No. 1, pp. 60-61).—Observations on stands of Virginia pine planted in Iowa where the species does not occur naturally indicated that it may be of considerable value for reclaiming gullies, eroded sites, and coal spoils banks. Virginia pine and the native red cedar are the only conifers known to be able to reproduce themselves in southeastern Iowa. Indications are that Virginia pine can survive at least to 41.5° north latitude and west to the 94th meridian.

Transpiration of pine seedlings as influenced by foliage coatings, H. MARSHALL and T. E. MAKI. (U. S. D. A.). (*Plant Physiol.*, 21 (1946), No. 1, pp. 95-101, illus. 1).—Widespread losses which occur frequently in young conifer plantings during the first weeks after the seedlings are set in the field are attributed to desiccation resulting from continued transpiration and the failure of the recently disturbed root systems to make up the daily water deficit. In these experiments the water loss of white pine, red pine, and loblolly pine seedlings was determined gravimetrically during exposure to conditions of high temperature and low humidity and ample moisture in the potting medium. Seedlings top-dipped in an emulsion of lanolin or a commercial paraffin wax transpired during 4 days of exposure less than 40 percent as much as untreated seedlings. Untreated seedlings did not respond to a substantial rise in temperature on the fifth day of exposure with as large an increase in water loss as did the coated seedlings. On the basis of water loss per unit fresh weight, red and loblolly pines transpired, respectively, 68.7 and 79.7 percent as much as white pine. The calculation of root volumes per unit fresh weight showed a closely similar relationship. Regression equations demonstrated that water loss varies directly as the fresh weight of the seedling within the range of the data presented.

Use of mulch, fertilizer, and large stock in planting clay sites, W. E. McQUILKIN. (U. S. D. A.). (*Jour. Forestry*, 44 (1946), No. 1, pp. 28-29).—Results of a small experiment conducted in the Beltsville Experimental Forest with red pine and black locust seedlings demonstrated the usefulness of mulch for reducing frost heaving and indicated the futility of fall planting on bare, unprotected clay soils. Mulch is beneficial also in preventing soil washing and facilitating water infiltration. Heaving was less severe among fertilized than among unfertilized trees. Presumably the sale concentration of the soil solution was increased and its freezing point depressed sufficiently to reduce the violence of the heaving action. Larger seedlings were less susceptible to frost heaving than were smaller plants. Species was also important, with almost twice as much heaving in locust as in red pine. Fertilizer was definitely more beneficial to locust than to pine and was in fact harmful to the smaller sized pines.

Indiana strip-mine plantings, L. E. SAWYER (*Jour. Forestry*, 44 (1946), No. 1, pp. 19-21).—Since 1926 various attempts have been made to plant forest trees on the spoil piles resulting from the surface mining of coal. A great number of species were tested with varying results. Except for isolated areas where soil conditions were evidently more favorable or trees were planted in association with black locust, none of the hardwood plantings were considered successful. Of several species of pine which showed promise, jack, red, white, and Scotch pines were outstanding. Observations on some volunteer stands of native cottonwood and sycamore showed them to be making substantial growth. A definite plan is now being developed to study the problem on a well-organized basis.

A color reaction of wood with methanol-hydrochloric acid, I. H. ISENBERG and M. A. BUCHANAN (*Jour. Forestry*, 43 (1945), No. 12, pp. 888-890).—Shavings from a large number of authentic wood samples, mostly American woods, were tested with methanol-hydrochloric acid reagent consisting of 25 cc. of concentrated acid in 1,000 cc. of methanol. A total of 277 species representing 123 genera in 56 families were examined. Many of the species did not give a purple reaction, in some a different color developed, and in others there was no apparent reaction. The speed of the color reaction varied greatly with the species. All forms of *Acer* except box elder, *A. negundo*, gave an intense color in a short period. Species in the red oak group, with some exceptions, showed a purple coloring in both sapwood and heartwood, while white oaks showed color only in the heartwood. Sapwood of shortleaf pine colored quickly while that of loblolly pine did not, suggesting a possible means of distinguishing between the two species. Differences in other species are pointed out. Methanol proved by far the best solvent tested.

DISEASES OF PLANTS

The Plant Disease Reporter [December 15, 1945, and January 15, 1946] (*U. S. Dept. Agr., Plant Disease Rptr.*, 29 (1945), No. 28, pp. 709-732, illus. 2; 30 (1946), No. 1, pp. 34, illus. 2).—In addition to brief notes on diseases of sweetpotato, rutabaga, celery, tomato, tobacco, pear, oak, and calla, the above issues contain the following signed notes and articles:

No. 28.—Host-parasite check list revision—*Baptisia* to *Cyamopsis* (Leguminosae), by F. Weiss; how accurately are we estimating plant disease losses? by K. S. Chester (Okla. Expt. Sta.); tobacco diseases in Kentucky in 1945, by W. D. Valleau, E. M. Johnson, and S. Diachun (Ky. Sta.); Southern Cooperative Corn Disease Research Committee report for 1945, by J. H. McLaughlin; and a correction—aecial stage of *Puccinia rubigo-vera*, by F. Weiss.

No. 1.—Host-parasite check list revision—*Desmanthus* to *Lupinus* (Leguminosae), by F. Weiss; damaged peanuts in Alabama in 1945, by C. Wilson (Ala. Sta.); powdery mildew of annual lespedezas, by J. L. Weimer and J. M. Elrod (Ga. Sta.); a partial survey of the genus *Lycopersicon* for resistance to *Phytophthora infestans*, by M. C. Richards and R. W. Barratt (N. H. Sta.); an epiphytotic of rhizopus soft rot of green-wrap tomatoes in California, by K. F. Baker (Univ. Calif.); three hitherto unreported diseases of corn in Pennsylvania—*Helminthosporium carbonum*, *H. maydis*, and crazy top, by C. C. Wernham (Pa. State Col.); bacterial diseases of plants in California in 1945, by P. A. Ark and C. M. Tompkins (Univ. Calif.); and diseases of vegetable crops during November in Palm Beach County, Fla., by G. R. Townsend, R. C. Cassell, and E. L. Felix (Fla. Sta.).

[Papers on plant diseases] (*Iowa State Hort. Soc. [Rpt.]*, 79 (1944), pp. 78-89, 103-107, 302-308, 312-317, 335-337).—The following are included: Arsenical Injury and Some New Fungicides, by H. G. Swartwout (Univ. Mo.); The Status of Orchard Diseases in Iowa, by G. C. Kent (Iowa Expt. Sta.); Purple Top Wilt of Potatoes and Its Significance in Seed Certification, by J. G. Leach; The Indexing, Tuber Uniting, and Increase of Superior Stocks of Seed Potatoes, by A. G. Tolaas; and Insect Transmission of Potato Diseases, by J. G. Leach.

Notes on Wisconsin parasitic fungi, V, VI, H. C. GREENE (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 225-268).—In part 5 of this series (E. S. R., 91, p. 693; 94, p. 32) (pp. 225-243), during the course of routine checking of hosts in connection with the study of fungi parasitic on plants in Wisconsin, occasional herbarium specimens were found bearing parasites not previously reported for the State. A survey was made, and the notes here presented are in large part based on the 75 additional hosts and 20 further species discovered and here reported,

together with relevant material. In part 6 (pp. 245-268), the fungi discussed were—unless otherwise specified—collected in the vicinity of Madison in 1943. Like the preceding year, 1943 was very favorable for the development of parasites and a considerable number of new and rare species were found.

Virus diseases of plants, F. C. BAWDEN (*Jour. Roy. Soc. Arts*, 94 (1946), No. 4710, pp. 136-168, *illus.* 21).—This paper consists of a course of three lectures run together "in order to present a more consecutive story" of the present status of knowledge on this group of virus diseases.

Electrophoretic studies with the plant viruses, V. L. FRAMPTON and W. N. TAKAHASHI, (Cornell Univ.). (*Phytopathology*, 36 (1946), No. 2, pp. 129-141, *illus.* 7).—The authors describe a scheme for diagnosing plant virus diseases and identifying the viruses based on a comparison of the scanning patterns obtained on electrophoresis of plant protein extracts from healthy v. diseased plants. Such patterns obtained with tobacco plants infected with tobacco mosaic, James Johnson's cucumber mosaic No. 1, Price's indicator strain of cucumber mosaic No. 1, and potato X and Y viruses and patterns obtained with pea bean plants infected with Zaunmyer's bean virus No. 4 proved specific in each case to the virus in question. The scanning patterns obtained with diseased plants differed from those obtained with healthy plants in that an abnormal shadow appeared with the diseased material. With tobacco mosaic, the cucumber mosaics, and the bean virus, the specific shadows for the healthy proteins were not affected by the incidence of the infection; with the potato viruses, the viruses appeared to migrate with one of the normal proteins. Patterns are included for virus-free potato tubers and for field-grown tubers reputed to be healthy. Patterns obtained with healthy plants from a given genus were remarkably similar and differed from those obtained with another genus.

Soil factors in relation to incidence and symptom-expression of virus diseases, H. H. MCKINNEY, (U. S. D. A.). (*Soil Sci.*, 61 (1946), No. 1, pp. 93-100).—Though little experimental work has been done relative to the influence of edaphic factors on the expression of the virus diseases, it is known that nutritional influences do modify symptoms; in tobacco mosaic, nutrition is known to affect the amount of virus produced in the plant. This review (35 references) deals with the incidence of virus diseases (wheat mosaic, tobacco mosaic, tomato mosaic and streak, lettuce big vein) in relation to soil factors and the influence of soil factors on the activity of viruses in the plant and on plant reactions.

Leafhopper transmission of the virus causing Pierce's disease of grape and dwarf of alfalfa, W. B. HEWITT, B. R. HOUSTON, N. W. FRAZIER, and J. H. FREITAG, (Univ. Calif.). (*Phytopathology*, 36 (1946), No. 2, pp. 117-128, *illus.* 2).—The known distribution and spread of alfalfa dwarf, as well as the patterns of distribution in the vineyards of grapevines affected by Pierce's disease, suggested insects as vectors. Pierce's disease was usually found more prevalent in districts where considerable alfalfa was grown and in portions of vineyards adjacent to alfalfa fields; under such conditions the latter were usually found infested with dwarf. Root pieces from diseased grapevines inserted into the roots of alfalfa plants apparently transmitted the virus in 12 of 35 trials. The same four species of leafhoppers—*Draeculacephala minerva* Ball, *Carneoccephala fulgida* Nott, *Helochara delta* Oman, and *Neokolla circellata* Baker—that transmitted the alfalfa dwarf virus were at the same time proved capable of transmitting the virus of Pierce's disease. Many field collections of these four leafhoppers were found to be carrying a virus transmissible to alfalfa and grape plants and producing dwarf and Pierce's disease, respectively. Collections of the same four species known to be originally nonviruliferous were found capable of transmitting the virus of either Pierce's disease from affected grapevines or dwarf from affected alfalfa to healthy alfalfa and grapevines. The majority of field collections of *D. minerva*, *C. fulgida*, and *H. delta* were

nonviruliferous, whereas 59 percent of the lots of *N. circellata* tested were already viruliferous. According to these intertransmission tests, the virus of Pierce's disease of grapes also causes dwarf in alfalfa.

A rapid method for isolating single ascospores from apothecia. V. F. TAPKE. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 2, pp. 167-168).—By the technic described, an apothecium is dropped into a vial slightly greater in height and diameter than the apothecium and containing enough 95 percent alcohol to rise to two-thirds the height of the apothecium after it is dropped in. The alcohol causes ejection of a cloud of ascospores. In quick succession, three petri dishes containing nutrient agar are momentarily opened in this spore cloud; the last one usually catches a few widely scattered ascospores in ideal position for isolation.

Two new chytrid parasites of Chytriomycetes. J. S. KARLING (*Mycologia*, 38 (1946), No. 1, pp. 103-109, illus. 1).—*Rhizophydium chytriomycii* and *Rozella chytriomycii* are two new species of chytrid parasites here described which occur on and in the sporangia of *Chytriomycetes*. The first attacks *C. hyalinus* and *C. aureus*; the second is limited to *C. hyalinus*. Extensive efforts to inoculate numerous other chytrids and larger fungi with these parasites failed.

A clamp-bearing fungus parasitic and predaceous on nematodes. C. DRECHSLER. (U. S. D. A.). (*Mycologia*, 38 (1946), No. 1, pp. 1-23, illus. 7).—*Nematotomus haptocladus* n. sp. is described and illustrated; capturing and consuming various nematodes—especially *Panagrolaimus* sp.—and also destroying them in free condition, it was found in decaying plant leaves near Greeley, Colo.

Elsinoë on Randia. A. E. JENKINS and A. A. BITANCOURT. (U. S. D. A. et al.). (*Mycologia*, 38 (1946), No. 1, pp. 65-68, illus. 1).—*E. pueritoricensis* n. sp. is described as causing a conspicuous scab on fruits of *R. mitis* and other species of this rubiaceous genus in the West Indies; leaves and stems are also affected.

Fighting fungi—Trichoderma against Rhizoctonia. I. C. BIGG [H. S. FAWCETT] (*Calif. Citrog.*, 31 (1946), No. 4, pp. 114, 140-142, illus. 3).—This is a story of research in biological control among fungi—one of the "imaginative but technically accurate and well-told descriptions of what goes on in the world of things too small to be seen with unaided eyes."

Soil as a medium for transfer and multiplication of disease organisms. S. D. GARRETT (*Soil Sci.*, 61 (1946), No. 1, pp. 3-8).—Any soil-borne plant parasite is involved in two principal biological relationships—that with its host and that with other members of the soil population. This review (21 references) is concerned chiefly with the root-infecting fungi and their behavior and ecology.

Soil-borne diseases in relation to the microflora associated with various crops and soil amendments. G. B. SANFORD (*Soil Sci.*, 61 (1946), No. 1, pp. 9-21, illus. 1).—During recent years the viewpoint of the plant pathologists on soil-borne diseases has shifted toward a greater appreciation of the various influences exerted by the associated microflora on the growth and persistence of the pathogen. In this review (39 references), the author considers the newer trend with special relation to common scab of potato, potato stem canker, root rots of wheat, and disease incidence in relation to the rhizosphere. It is hoped that some of the points here raised will indicate the complexity of the general problem of biological control of soil-inhabiting plant pathogens and also the opportunities for future research.

Soil management and plant nutrition in relation to disease development. J. C. WALKER (Univ. Wis.). (*Soil Sci.*, 61 (1946), No. 1, pp. 47-54).—The present status of knowledge gives an indication that plant nutrition is one of the environmental factors which—along with others—may have a measurable effect on the course of disease development. "What we need is more intensive research both under controlled nutrient culture and in the field with specific hosts and their parasites before we may expect to have a basis for generalization." In this review (24 references)

the author's discussion revolves principally around the fusarium wilt diseases, the reaction of two distinct types of disease to nutrition in the same host (cabbage yellows and clubroot), and soil reaction. There is believed to be little basis of hope that soil management and fertilization will solve any large percentage of problems in plant disease control, but studies of host nutrition in relation to disease development may yield information of aid in modifying soil practices that may often be used to reduce the acuteness of disease losses.

Control of plant disease by use of inorganic soil amendments, R. H. DAINES. (N. J. Expt. Stas.). (*Soil Sci.*, 61 (1946), No. 1, pp. 55-66).—Out of a long list of inorganic substances tried, a few have succeeded sufficiently well in reducing disease incidence—at least regionally—to have become established ingredients for use in plant disease control. The inorganics most commonly used as soil amendments fall into two groups, viz. sulfur and liming materials, and mercury and copper. The literature on these the author reviews (37 references) and adds a brief reference to some new developments with other substances.

Volatile soil fumigants for plant disease control, A. G. NEWHALL. (Cornell Univ.). (*Soil Sci.*, 61 (1946), No. 1, pp. 67-82, illus. 3).—In this review (14 references) the need is stressed for a cheap method of eradicating pathogenic organisms, especially nematodes, from field soils—a need which promises one day to be met by use of volatile fumigants injected beneath the soil surface. The requirements of the ideal soil fumigant are outlined, and methods of testing are described. Factors influencing the effectiveness of any given material are discussed—with special reference to chloropicrin. Data on the nematocidal effectiveness of several of the better-known soil fumigants are given, including chloropicrin, CS₂, DD mixture, ethylene dichloride, and methyl bromide. The evolution of machinery designed to apply such fumigants is outlined, and some of the unsolved problems in the field are discussed.

Soil-steaming for disease control, J. JOHNSON. (Wis. Expt. Sta. and U. S. D. A.). (*Soil Sci.*, 61 (1946), No. 1, pp. 83-91).—In this review (26 references) "soil-steaming is discussed with special reference to its bearing on phytopathological research and plant disease control problems. The limitations and advantages of the treatment are particularly emphasized, together with brief reference to the methods available for the purpose. Although the chief object of steaming may be to destroy soil-borne disease organisms, many other desirable results are usually accomplished at the same time. These secondary effects often may be confused with the actual benefits derived from disease control. Conversely, retardation and other harmful effects on plant growth sometimes result which may lead to erroneous conclusions. Means for reducing such harmful effects are suggested. The influence of steamed soil on the subsequent development of lower organisms, including plant pathogens, involves many factors which need to be taken into consideration in research studies as well as in practical control methods."

Microbial antagonism and disease control, R. WEINDLING. (U. S. D. A. and S. C. Expt. Sta.). (*Soil Sci.*, 61 (1946), No. 1, pp. 23-30).—The author in this review (12 references) defines the present status and the prospects of biological control of plant diseases as far as it relates to microbial antagonisms against soil-borne plant pathogens, in the general part presenting a synopsis of basic concepts of biological control and in the special part emphasizing recent work on two specific pathogens—*Ophiobolus graminis* and *Phymatotrichum omnivorum*. With regard to other disease-producing organisms, reference is made to previous reviews. In a final section, biological control of soil-borne pathogens and the mechanism of microbial antagonism are discussed.

Soil temperature, moisture, aeration, and pH as factors in disease incidence, C. CHUPP. (Cornell Univ.). (*Soil Sci.*, 61 (1946), No. 1, pp. 31-36).—Except in a

few textbooks and articles, the ecological relationships of plant diseases were neglected until about 1900; since then the literature has become more profuse. "It hardly is possible to determine when the true relations of soil temperature and moisture to disease production were established, but it can be said definitely that in late years, L. R. Jones of Wisconsin and his earlier students had much to do in directing the research pertaining to the influence of the soil on disease in plants." Some of the more recent work is reviewed (10 references).

Pathogenic and physiogenic damping-off, W. S. BEACH. (Pa. Expt. Sta.). (*Soil Sci.*, 61 (1946), No. 1, pp. 37-46, illus. 1).—"Pathogenic damping-off involves decay and disintegration of seedling stems, particularly at or near the surface of the soil. . . . Physiogenic damping-off comprises injuries caused by physical or non-living factors of the environment. These injuries may be termed 'noninfectious or nonparasitic diseases' because no causal organisms are essential for their development." These two types, the factors influencing them, and their control are reviewed (10 references).

Soil factors affecting incidence of root knot, R. R. KINCAID. (Fla. Expt. Sta.). (*Soil Sci.*, 61 (1946), No. 1, pp. 101-109).—Soil factors—physical, chemical, and biological—have a controlling influence on the occurrence and activities of the root knot nematode, especially when free in the soil as eggs or larvae, and also on its effects on plants. Temperature, moisture, sunlight, aeration, H-ion concentration, organic matter and biological control, and soil fertility are the primary factors discussed in this review (42 references). Effects of flooding and fallow and movement and distribution of the nematodes in relation to soil texture and other factors are also considered.

A nematode-destroying phycomycete forming immotile spores in aerial evacuation tubes, C. DRECHSLER. (U. S. D. A.). (*Bul. Torrey Bot. Club*, 73 (1946), No. 1, pp. 1-17, illus. 36).—The new fungus—offering unusual features both in its parasitic development and in its asexual reproduction—was obtained from partly decomposed leaves of red maple bordering a pond in Delaware. It appears to be a primitive member of the Entomophthoraceae and is here described and discussed in detail as *Gonimochaete horridula* n. gen. and sp. It was found destroying nematodes of the genus *Acrobeloides*. There are 44 references.

Chemical control of seed-borne fungi during germination testing of peas and sweet corn, W. CROSER. (N. Y. State Expt. Sta.). (*Phytopathology*, 36 (1946), No. 2, pp. 92-99).—In germination tests of Stowell Evergreen sweet corn infested with *Diplodia zeae* and mold fungi and treated with Arasan, du Pont No. 1452 C, Semesan Jr., and United States Rubber No. 604 at 11 official seed stations, Arasan excelled in control of *D. zeae* and *Fusaria* and 1452 C against *Rhizopus nigricans*—both as to seed germination and green weights of seedlings. In germination studies with Thomas Laxton peas, Arasan, Ceresan, Spergon, and 604 increased the green weights, while Semesan Jr. did not; in this respect Arasan excelled. Spergon proved superior in controlling *R. nigricans* and in seed germination; 604 was best against other mold fungi and bacteria. When planted in infested soil, seed treated with Ceresan and Semesan Jr. germinated poorly; Spergon, Arasan, and 604 (in this order) afforded excellent protection against damping-off.

A case of molybdenum deficiency in New Zealand, E. B. DAVIES (*Nature [London]*, 156 (1945), No. 3961, pp. 392-393, illus. 1).—In a study involving some 20 combinations of two and three of the elements manganese, zinc, copper, molybdenum, and boron with and without lime and with the usual essential nutrients provided, the so-called whiptail disease of cauliflower did not develop. At an early stage all plants not receiving molybdenum developed an interveinal chlorosis, and the symptoms were even more evident where lime was also omitted. The addition of sodium molybdate to the soil brought about a quick recovery of the

affected plants. Although molybdenum deficiency has been observed in South Australia and Tasmania, this is said to be the first instance observed in New Zealand.

Magnesium deficiency in some crop plants in relation to the level of potassium nutrition, T. WALSH and T. F. O'DONOHUE (*Jour. Agr. Sci. [England]*, 35 (1945), No. 4, pp. 254-263, illus. 2).—The results of the investigation are presented in detail for the crop plants used, viz, potato, tobacco, sugar beet, wheat, barley, and crucifers. The general conclusion was that the K : Mg ratio of both soil and plant merits attention in any attempt to account for the development of Mg deficiency; the wider the ratio in each case, the greater was the tendency to deficiency expression. The findings provide data as to the levels of Mg at which deficiency may be expected to develop in the plants under test. In potato this varied from 0.17 to 0.38 percent, plants at the lower content being very severely affected. Mg-deficient tobacco leaves contained 0.06, sugar beet 0.05 (0.2 in a field crop), barley 0.05, and mangolds 0.22 to 0.43 percent.

Results of cooperative corn, flax, and soybean seed treatment tests in 1944 (*U. S. Dept. Agr., Plant Disease Rptr.*, 1945, Sup. 159, pp. 201-224).—Detailed results—largely tabulated data—are presented for the following: Cooperative Corn Seed Treatment Trials for 1944 in the Central and Northern States Region, by G. Semeniuk (pp. 203-214); Cooperative Flax Seed Treatment Tests in 1944, by F. J. Greaney (pp. 215-219); and Results of the Uniform Soybean Seed Treatment Tests in 1944, by W. B. Allington, G. C. Kent, I. W. Tervet, and B. Koehler (pp. 220-224).

Septoria disease of Gramineae in western United States, R. SPRAGUE (*Corvallis: Oreg. State Col.*, 1944, pp. 151, illus. 21).—This monograph presents the results of studies on the life history and taxonomy of the species of *Septoria* known to occur on members of the grass family in Oregon and Washington, together with comparable data from certain other western and northern Great Plains States. Some data are included for many of the species in most of the area west of the Mississippi River. Recent field observations (1940-43) have also been made in certain of the northern Great Plains States, particularly North and South Dakota and Nebraska. Species of *Septoria* are known to attack 94 species of grains and grasses in the western United States. New information on these fungi is especially important because of increasing interest in leaf- and glume-spot diseases of cereals and the renewed need for information on related diseases of grasses. Preliminary discussion sets forth the methods of procedure and the factors used in determining the species and their subdivisions; the genus is then characterized and discussed historically, following which the individual species are taken up in detail. A key to related genera and to *Septoria* spp., a bibliography (122 references), a tabulation of the hosts and species and their occurrence, and host and fungus indexes complete the monograph. New taxonomy is involved in eight species.

Testing wheat seedlings for resistance to *Helminthosporium sativum*, P. M. SIMMONDS and B. J. SALLANS (*Sci. Agr.*, 26 (1946), No. 1, pp. 25-33, illus. 1).—The results of preliminary studies on two rapid methods for testing wheat varieties for resistance in the seedling stage to infections by *H. sativum* are presented. The first method consists of test tubes fitted with a strip of blotting paper folded to provide a shelf about 2 in. from the top of the tube. Water is added level with the shelf, the inoculated seeds are placed on it, and after 7 days' incubation the infections are recorded. In the second method, petri dishes fitted with moistened filter paper are employed; the inoculated seeds are laid in rows and incubated for 5 days. The tests indicated that the Marquis, Thatcher, Red Bobs, and Apex varieties have more resistance than Mindum, Regent, Reward, Pelissier, and Renown. The trials were with seedlings only; although possibly of value in analyzing breeding material, any

interpretation of the behavior of a variety beyond the seedling stage must be made with caution.

New stem rust resistant wheats to replace Eureka, S. L. MACINDOE (*Agr. Gaz. N. S. Wales*, 56 (1945), No. 12, pp. 530-531, illus. 5).—The author states that since 1942 the former high stem rust resistance of Eureka wheat and its "Kenya" parent has broken down. Now several new stem rust-resistant varieties—Gabo, Charter, Kendee, Yalta, and Celebration—developed in New South Wales are reported as becoming available.

Seed disinfection.—VII, Mechanical principles, W. A. R. DILLON WESTON and R. E. TAYLOR (*Jour. Agr. Sci. [England]*, 35 (1945), No. 4, pp. 239-242, illus. 1).—In this installment (E. S. R., 93, p. 728), substantial control of covered smut of wheat (*Tilletia caries*) is reported for seed treated with an approved organo-mercury seed disinfectant mixed with rotational or gravitational machines; good control of oats leaf spot (*Helminthosporium avenae*) was also obtained, in this case the grain and powder being mixed together in a model rotational-type machine. This latter machine gave an even mixing with as few as 48 turns; 24 turns were almost as effective but the mixing was much less even. The gravitational machine proved less efficient in giving an even mixture, as indicated by the relative control of covered smut of wheat; improved efficiency of this machine was obtained by adding a felt lining to the feed hopper.

Arasan for control of fungi in germinating corn seed, W. CROSTER and S. PATRICK. (N. Y. State Expt. Sta.). (*Phytopathology*, 36 (1946), No. 2, pp. 162-164).—When applied to 10 lots of sweet corn seed, neither Arasan alone nor its admixture with flour depressed germination in 3- or 6-day tests; treated seed germinated normally after storage for 1, 2, or 3 mo. Arasan retarded the growth of *Diplodia zeae*, *Rhizopus nigricans*, and *Fusaria*. Seedlings from Arasan-treated seeds weighed more than those from the untreated.

Ergot on Pennisetum hohenackeri Hochst., M. J. THIRUMALACHAR (*Nature [London]*, 156 (1945), No. 3973, p. 754).—Report of a *Claviceps* coming nearest to or identical with *C. microcephala* on the grass *P. hohenackeri* (*P. alopecuroides*) in India.

Susceptibility of South American tuber-forming species of Solanum to the potato-root eelworm Heterodera rostochiensis Wollenweber, C. ELLENBY (*Empire Jour. Expt. Agr.*, 13 (1945), No. 51, pp. 158-168).—Since larvae of the potato nematode emerge from the cysts only when stimulated by excretions from the roots of potato plants, it is possible to envisage plants which—not producing the proper stimulus—are free from attack. The author describes tests for such plants carried out since 1941 on South American tuber-forming species of *Solanum*. Representatives of about 40 species were found with nematode cysts on their roots after growing in infested soil, and root excretions from 56 forms were observed to stimulate larval emergence. In most cases the South American forms appeared less susceptible, fewer cysts being found around their roots and their root excretions stimulating fewer larvae to emerge. These differences were not always due to variations in vigor; they were shown in experiments with "standardized" root excretions and by plants which were clearly more vigorous than those of domestic species of *S. tuberosum*. An experiment described suggests that cysts from the South American species may also be less viable.

Control of dry rot of seed potatoes by dusting, C. E. FOISTER, A. R. WILSON, and A. E. W. BOYD (*Nature [London]*, 156 (1945), No. 3961, p. 394).—Preliminary trials with a dust made up of 12 oz. thymol in 10 lb. kaolin per ton of tubers gave promising results in control of *Fusarium caeruleum* dry rot.

Handling and shipping early potatoes, D. H. ROSE (*U. S. Dept. Agr. Cir.* 744 (1946), pp. 44, illus. 21).—Early potatoes—dug before maturity—are usually marketed

directly from the field; they are highly perishable and need far more careful handling during harvest and shipment than is commonly given. This circular summarizes results bearing on the subject that have been obtained by research in various parts of the United States during 1938-45. These investigations have shown that potatoes skinned during harvest and subsequent handling are susceptible to browning of the skinned area when exposed to dry air for only 15 to 30 min.; such areas are likely to darken in transit and may become sticky and superficially decayed from bacterial growth. It is also shown that potatoes exposed to heat in the field for no longer than 0.5 to 1 hr. may be rendered susceptible to bacterial soft rot by *Erwinia carotovora* and associated soil bacteria. The injury is likely to occur whenever the air temperature in the shade rises above 90° and the potato temperature is 110° F. or higher during a period of 1 or more hours. Damage from the rot—often very serious—usually fails to occur until the potatoes are on the way to market. Methods are suggested to prevent browning and heat injury of early potatoes; recommendations are also made as to desirable types of protective service while in transit for shipments of early potatoes moving to market from various parts of the country.

The spread of potato scab in soil by potato plant humus, B. F. LUTMAN (*Vernoni Sta. Bul. 528 (1945), pp. 40, illus. 12*).—Examination of potato stems from scab-infected plots sometimes revealed typical browned and cracked scab lesions on the vertical portions. Many of the lenticels were browned and slightly enlarged, and such lenticels were also frequent on the white stolons terminating in badly scabbed tubers. The scabs found on stems and stolons appeared to be the same as those developing on the tubers. The normally white young roots exhibited brown spots in the cortical region as they became longer and larger. Sections showed some cell walls browned and swollen while others were transparent. The browned walls seemed to enclose filaments which excreted pigment into the cytoplasm; these filaments appeared to be the same as those seen in the skin of young tubers near young scab lesions; they are believed to be the growth of chromogenic actinomycetes.

Soil actinomycetes were grown in a differential liquid medium composed of pectin, arabinose, and inorganic salts in small cover-glass smears; this medium was also used as an agar gel. Since it had a pH of 5.6, the pectin was unavailable except to a very few bacteria. The actinomycetes germ tubes arose from the interior of disintegrated potato humus particles arising from previous crops 2 to 7 yr. old. The diameters of the hyphae varied, suggesting that more than one species of actinomycetes may be found within the potato plant. Few germinations were obtained from the soil before early June; the number increased until about mid-July, when they were checked by a drought. Heavy rains later failed to restore the rapidity or number of germinations for almost 2 mo.; germinations continued until December, when the last trials were made. This germination pattern follows the scab infection temperatures worked out under controlled conditions. The persistence of actinomycetes in the soil—especially that high in humus—was shown by the isolation of millions of *Actinomyces chromogenus* per gram from samples kept in glass-stoppered bottles for 7 yr.; they were still numerous in every bottle where the soil was moist.

Even if it contained no pathogens, potato humus would aggravate scab, since it contained 46 percent moisture at a time when the soil had no more than 23 percent; it was also quite alkaline—asccribed largely to the very numerous *A. albus* contained. Moreover, potato humus disintegrated very slowly in the soil as compared to that from buckwheat and rye. In one experiment potatoes were grown in soil entirely free from scab-producing actinomycetes but inoculated with infected potato humus; it had a pH of 6.4. This humus was made from potato remains of preceding years from plants grown on soil badly infested with pathogenic species. The tubers produced were much scabbier than those grown in adjacent uninoculated soil.

It is concluded from these findings that scab actinomycetes live in the soil in humus derived from parts of the potato plant other than the tubers. To control scab, therefore, it is suggested that insofar as practicable all potato remains be removed after harvest from land known to be favorable to scab. The bibliography covers nearly two pages.

Three important foliage diseases of soybeans—bacterial blight, brown spot, and bacterial pustule, S. G. LEHMAN (*Res. and Farming [North Carolina Sta.]*, 4 (1945), *Prog. Rpt. 1*, pp. 4-5, *illus. 3*).—Notes on the present status of research on these diseases and their control in North Carolina.

Induced baldhead in soybean, R. H. PORTER. (Iowa Expt. Sta.). (*Phytopathology*, 36 (1946), No. 2, pp. 168-170, *illus. 1*).—The author presents data indicating that a type of "baldhead" can be induced in soybean seedlings by planting seed in *Pythium*-infested soil at 10° C. (50° F.) for the first part of the germination period. Seeds of the varieties Banzei, Kanro, and Lincoln were planted in a mixture of sand and soil spontaneously infested with *P. graminicola* and *P. debaryanum*. The flats with soil mixture and seeds were kept for either 7 or 10 days at 10° and then transferred to 26°-28° for 5 days. Seedlings from untreated seed showed 8.2 to 39.2 percent of "baldheads" in which the plumule was either killed or partially decayed. Seedlings grown from seed treated with Arasan or Spergon were relatively free from this condition; those from untreated seed planted in sterilized sand at 10° C. were also free.

Boron deficiency in beets as correlated with yields and available boron, K. C. BERGER and E. TRUOG. (Wis. Expt. Sta.). (*Wis. Acad. Sci., Arts, and Letters, Trans.*, 36 (1944), pp. 421-425).—Since boron-deficiency symptoms in beets appear only when serious and after marked reduction in yields, they fail to serve always as a satisfactory means of telling when B fertilization is needed; determination of available B in soils, involving hot water extraction, appeared to be a much better method. Results from field tests revealed that sugar beets require at least about 1 p. p. m. of available B; table beets, slightly more. Common field beets are believed to require less than half these amounts.

Internal brown spot, a boron deficiency disease of sweet potato, C. J. NUSBAUM. (S. C. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 2, pp. 164-167, *illus. 2*).—The Porto Rico variety was grown on limed and unlimed field plots at three levels of K and supplied with borax at rates of 0, 5, 10, 20, and 30 lb. per acre. B-deficiency symptoms were observed only in plants on no-borax plots. At midseason the vine growth on B-deficient plants was restricted, internodes were shortened, petioles were curled, and terminals became stunted and distorted; as the season advanced, the older leaves were shed and many of the terminals died. At harvest the fleshy roots of B-deficient plants exhibited varying degrees of external and internal degeneration; they were misshapen with rough leathery skin and, in severe cases, with surface cankers. Severely affected roots had brown necrotic spots in the flesh—chiefly in the cambial region.

Stem rot infection—sweet potatoes (*New Jersey Stas. Plant Disease Notes*, 22 (1945), No. 11, pp. 41-44).—The data presented show that many of the early field stem rot infections occur through the unhealed wounds on the stem, that sprout treatments afford protection only during a relatively short time after setting out, and that infections take place throughout the growing season, although by far the greatest number occur during the first 2 to 3 weeks after planting. Stem rot is said to cause a larger reduction in yield of marketable roots in New Jersey than all other sweetpotato field diseases combined.

Field strains of tobacco-mosaic virus, E. M. JOHNSON and W. D. VALLEAU. (Ky. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 2, pp. 112-116).—Field and greenhouse inoculations with 54 virus strains from Kentucky and elsewhere resulted

in a wide range of symptoms—distinct for each strain—on necrotic spotting varieties of Burley and dark tobaccos. Inoculated plants developed various shades of mottling from dark green through yellow to pure white, accompanied by varying necrosis, dwarfing, and distortion. No two strains caused identical symptoms—either in the greenhouse or field. These findings indicate that many strains of tobacco mosaic virus exist in nature. It is suggested that the terms “tobacco virus 1,” “common field tobacco mosaic virus,” or “wild-type tobacco mosaic virus” should be avoided in the sense that they are sufficient for identification, since any one of the 54 strains used in this study is a common field or wild-type strain, yet no two are identical.

Two legume viruses transmissible to tobacco, E. M. JOHNSON. (Ky. Expt. Sta.). (*Phytopathology*, 36 (1946), No. 2, pp. 142-147, illus. 3).—A virus disease of alfalfa and one of white clover have been occasionally seen in fields and lawns in Kentucky. Affected alfalfa and clover are inconspicuously mottled. The white clover virus proved transmissible by the rubbing method to tobacco, red clover, pea, and bean; the alfalfa virus, by rubbing, to the above hosts and also to tomato, zinnia, cucumber, pepper, and pokeweed. The white clover virus was not transmissible to white clover by rubbing; the alfalfa virus was transmissible to alfalfa by aphids but not by rubbing. The physical properties of these viruses were similar. Because of this and the similar symptoms on susceptible species, the viruses appear to be strains of one virus, believed to be one of the alfalfa mosaics.

A comparison of various carbamates for the control of bean anthracnose, J. D. WILSON and H. A. RUNNELS (*Ohio Sta. Bimo. Bul.* 237 (1945), pp. 189-191).—In a 1945 test of five carbamates, bordeaux, and Isothan, four of the carbamates averaged at least 50 percent control of *Colletotrichum lindemuthianum* in the first and second pickings; one gave little or no control. Isothan reduced the disease but was comparatively ineffective at the strength used. Bordeaux in most instances was nearly as effective as Fermate, Dithane, and nickel carbamate. Zerlate consistently gave the best control, reducing the number of diseased pods by about 70 percent. Further comparisons emphasized the reduction in number of lesions per pod by the different materials; bordeaux compared even more favorably with carbamates on this basis, though Zerlate still had the best record. The degree of control obtained in these carefully sprayed plots was, however, not good enough for commercial growers. It is possible that better technic and timing may improve the results; in the meantime it is deemed likely that certified seed may result in the almost complete elimination of anthracnose within a few years.

The antigenicity of southern bean mosaic virus, W. C. PRICE and L. M. BLACK (*Phytopathology*, 36 (1946), No. 2, pp. 157-161).—Southern bean mosaic virus was shown to be serologically distinct from the viruses of tobacco necrosis, tomato bushy stunt, potato ringspot, potato vein-banding, tobacco mosaic, and tobacco etch. Its antiserum prepared with purified virus reacted specifically with juice from Bountiful bean plants infected with the virus. These serological results provide additional evidence that southern bean mosaic virus is an independent and distinct virus species.

Relative resistance and susceptibility of U. S. 243 and U. S. 343 lima beans to lima-bean mosaic, D. E. PRYOR and R. E. WESTER (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 2, pp. 170-172, illus. 1).—A diseased specimen of U. S. 343 apparently affected with mosaic was brought to the attention of the authors in June 1945; examination of the garden from which it came showed that two 20-ft. rows—one of U. S. 243 and one of U. S. 343—had been planted end to end. A large amount of mosaic was found in U. S. 343, but none in U. S. 243. Greenhouse inoculations substantiated the field observations in showing the virus to be lima bean mosaic. The resistance of U. S. 243 and the susceptibility of U. S. 343 is of particular interest, since both lines are selections from the same Fordhook X Sieva cross; Fordhook is resistant to the disease, whereas Sieva is susceptible.

Apparently, a resistant and a susceptible line were isolated by chance. This situation is another example of how, in selecting for desirable horticultural characters, genes for resistance may be lost unless particular attention is given to the pathological phases of the breeding program.

Environal factors affecting downy mildew of cabbage, M. W. FELTON and J. C. WALKER. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 2, pp. 69-81, illus. 4).—This study was concerned primarily with the disease as it affects young cabbage seedlings. Collections of the pathogen (*Peronospora parasitica*) from Florida, Louisiana, Texas, and Wisconsin all affected members of *Brassica oleracea*. No lesions appeared on some other members of the Cruciferae tested, though on others necrotic flecks occurred without sporulation. The common form in the United States seems to be a physiologic race restricted to *B. oleracea*. It is pointed out that the ordinary recommendation to eradicate wild hosts is valueless for controlling the disease.

The fungus sporulated most readily at 8° to 16°, and the conidia germinated most rapidly at 8° to 12° C. Penetration of the host occurred most rapidly at 16°, after which haustoria grew most rapidly at 20° and 24°. Symptoms developed most rapidly at 24°; when humidity was high, the lesions sporulated first at 24°. Although the disease ran its course most rapidly at 24° and 28°, sporulation and reinfection were limited and increased growth of the host resulted in rapid maturation and dropping of the lower leaves. The disease developed most profusely at 16°, where growth of both host and pathogen was slower but sporulation and reinfection were more pronounced. Low optima for sporulation, germination, and penetration proved more important for disease development than the higher optimum for fungus growth. The severity of the disease at 10° to 15° is best explained by the effect of temperature on production of inoculum, spore germination, and infection. The confusing observations recorded in the literature (22 references) relative to the effect of fertilizers on the development of mildew were not cleared up by the study of disease development on plants grown in a range of controlled nutrients. In fact, the results indicated that little benefit in control could be expected through adjustment of fertilization in the seedbed.

Cabbage black rot spread from infested seedbed, O. A. RLINCK and W. O. GLOVER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1916), No. 1, pp. 13-14, illus. 1).—The source of infection in an epidemic of bacterial black rot in western New York during 1945 was found to be the cabbage seedbed; seed treatment alone failed to give adequate protection. Precautionary measures to guard against the disease include hot-water treatment of the seed, seedbed sanitation (disease-free soil—not in susceptible plants for at least 3 yr. or carefully treated with calomel or mercuric chloride), and for field plantings a 3- to 4-yr. crop rotation and elimination of cabbage refuse or infested manure for 3 yr. preceding use for cabbage.

Cotton diseases: Report of Cotton Research Sub-committee on Cotton Diseases, G. M. ARMSTRONG ET AL. ([Clemson], S. C.: *Cotton Res. Com.*, 1945, pp. [27]).—This subcommittee of the Southern Experiment Station Committee or Research Council has prepared for the chief diseases a summary of current research work in progress, an inventory and digest of completed research, and a summary of needs in the light of this information. The sections of this report were prepared as follows: Angular Leaf Spot or Bacterial Blight, by W. W. Ray (Okla. Expt. Sta.); Fusarium Wilt, Root Knot, and "Rust," by A. L. Smith (Ga. Sta. and U. S. D. A.); *Phymatotrichum* Root-Rot, by L. M. Blank and E. W. Lyle (U. S. D. A. and Tex. Sta.); Seedling Diseases, by S. G. Lehman (N. C. Sta.); and Verticillium Wilt, by E. M. Cralley (Ark. Sta.).

The effect of colchicine and acenaphthene in combination with X-rays on plant tissue, II, M. LEVINE (*Bul. Torrey Bot. Club*, 73 (1946), No. 1, pp. 34-59, illus. 43).—

Following an introductory section on the materials and methods used (E. S. R., 94, p. 448), the author details the results of his investigation. Root tips of the Yellow Globe variety of onion were used, being selected for approximate uniformity in size and freedom from bruises and infection; 15 sets of experiments were carried out, in each of which 6 to 40 onions were employed. In several experiments colchicine was replaced by acenaphthene. The gross effects and cytological changes induced by different lengths of exposure to colchicine followed by 900, 1,500, and 3,000 r. are minutely described and illustrated by photographs and photomicrographs.

The cell arrangement following colchicine treatment alone was so regular that no analogy between this hypertrophy and the crown gall disease or malignant growth in animals could be made; the "colchicine tumor" thus does not fall into any category of tumor growth. Polyploidy does not appear to be the sole criterion for malignancy. It seems that while colchicine causes analogous cytological changes at 6, 12, 18, 24, and 48 hr. of exposure, the longer exposures induce some microscopically unrecognizable alterations which permit the cells to resume growth for a short period after the shorter exposures to colchicine followed by 1,500 r., but completely and permanently arrest growth when the longer colchicine exposures are followed by the same X-ray dosage. This is taken as evidence that these agents supplement each other effectively. Root tips of bulbs X-rayed only were studied immediately after the roots had been irradiated by 1,500 r.; the cytological changes of the division figures were less marked than in the colchicized-X-rayed root tips. It is obvious from the general findings that the effects of colchicine and irradiation are more active when combined than when used singly. The irradiated plants were affected, but not so much as those receiving the longer colchicine treatments. The optimum effect was apparently attained when irradiations were combined with a colchicine exposure of more than 36 hr. The combination of 900 r. with 0.01 percent colchicine for 72 hr. or 1,500 r. with 48 hr. proved most effective in arresting root growth without destroying the root. It appeared that the longer colchicine exposures induced some nonrecognizable toxic change which rendered the cells more susceptible to the irradiation. The fact that the greatest X-ray effect was induced after exposures to colchicine for more than 48 hr. indicates that the action of the X-rays is independent of the nuclear division phase but is in some way dependent on the influence exerted by the colchicine.

Onion smut, C. M. HAENSELER (*New Jersey Stat. Plant Disease Notes*, 22 (1945), No. 12, pp. 45-48).—Onion smut—largely limited to the northern part of New Jersey—is said to be the only onion disease calling for specific control in the State. A direct seed treatment requiring no special attachment to the seeds was found to have certain advantages over the liquid formaldehyde method now in common use. The new technic consists in covering the seeds with a very heavy coating of protectant chemical; several materials have proved very effective, but tetramethylthiuram disulfide (Thiosan) is the one to be used during 1946 in the affected area where onions are grown from seed.

Calomel and onion eelworm, T. GOODEY (*Nature [London]*, 156 (1945), No. 3961, pp. 393-394).—On the basis of tests reported it is not believed that calomel will prove of service for controlling nematodes (*Anguillulina dipsaci*) attached to onion seeds; fumigation of contaminated seeds with methyl bromide, however, proved fully effective.

Effect of growth-regulating substances on the development of apple scald, H. A. SCHOMER and P. C. MARTH. (U. S. D. A.). (*Bot. Gaz.*, 107 (1945), No. 2, pp. 284-290, illus. 1).—The experiments reported were conducted during two storage seasons (1943-45); α -naphthaleneacetic and β -indolebutyric acids and a mixture consisting of equal parts of α -naphthaleneacetic acid, α -naphthaleneacetamide, β -naphthoxyacetic acid, and β -indolebutyric acid were tested at 10, 100, and

500 p. p. m. in lanolin (0.4 percent) emulsion on fruits of Arkansas (Mammoth Black Twig), Stayman Winesap, Grimes Golden, and York Imperial varieties. The fruits were treated after harvest and prior to 31° F. storage by dipping in the lanolin-growth regulator emulsions or by using a liquefied-gas aerosol of the substance. The amount of scald development was noted at the end of the storage season, after the fruits had been held for 7 days at 70° to allow for maximum scald development. Treatment resulted in consistently less scald than on control fruits. The greatest reduction was on Arkansas, with an average of 24 percent more unscalded fruits in the treated lots; less marked reductions occurred on the other three varieties. No appreciable differences were noted among the various compounds or concentrations employed. The lanolin-emulsion dip appeared to give slightly better control than the aerosol treatments. The decrease in scald development was manifested as a reduction in both severity of scald and total number of fruits affected.

Methyl bromide fumigation injury to Williams apples, A. L. KENWORTHY. (Del. Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans.*, 58 (1944), pp. 62-65, illus. 1).—Methyl bromide fumigation of Delaware-grown Williams apples caused a loss of 75 percent on 35 cars in 1944; Starr, Wealthy, and Yellow Transparent apples were not affected. Fruit temperatures above those for the fumigation increased the injury listed as "surface injury" or "scald" and initial internal damage. Advanced internal injury appeared independent of fruit temperatures until removal from refrigeration; higher fruit temperatures at time of fumigation resulted in a more rapid increase in this type of injury on removal.

Cleaning up the apple orchard following a bad scab year, D. H. PALMITER. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, pp. 3, 8).—A note on the heavy carry-over of apple scab inoculum from 1945 which calls for special control measures for 1946, including ground sprays for certain areas.

The effect of ultraviolet radiation on the viability of fungus spores and on the development of decay in sweet cherries, H. ENGLISH and F. GERHARDT. (U. S. D. A.). (*Phytopathology*, 36 (1946), No. 2, pp. 100-111, illus. 1).—The authors determined the effects of radiation at wavelength 2,537 a. u. on the spores of seven fungi causing decay in sweet cherries and on the development of the rot. At 18 in. from the lamp, most of the spores of *Penicillium expansum* were killed within 30 sec., but only a few of the conidia of *Alternaria* sp. were destroyed after a 5-min. exposure. The sensitivity of the spores of *Botrytis cinerea*, *Cladosporium herbarum*, *Pullularia* sp., *Rhizopus* sp., and *Sclerotinia fructicola* lay between these extremes. Spores with dark walls proved more resistant than those with light walls. Colony formation from viable irradiated spores was noticeably retarded. The number of living spores on the fruit conveyor in a sweet cherry packing plant was reduced by exposure to the irradiation, but the population of viable air-borne spores in a treated section of the packing room did not differ from that in a portion receiving no treatment. Blue-mold decay in artificially injured and contaminated sweet cherries was not reduced by exposure to ultraviolet light; neither was spontaneous decay controlled, even though the exposure was extended up to 24 times that employed commercially. As used in these studies, ultraviolet light appears to offer no promise for controlling decay in sweet cherries. There are 19 references.

Studies on the cause and prevention of a peach disease in Oklahoma, known as catfacing, F. A. FENTON, F. E. WHITEHEAD, and C. H. BRETT. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.*, 25 (1945), pp. 34-37).—"Catfacing," a malformation of peach fruits, is reported to have been produced experimentally by caging adult tarnished plant bugs on young peaches after the shucks had split. These bugs also caused the blossoms to drop either before or after petal fall. These insects bred in herbaceous vegetation, primarily in hairy vetch, evening-primrose, and mare's tail.

which occurred in succession and so enabled the bugs to breed rather continuously through much of the crop-growing season. Sprays of nicotine sulfate, amorphous, or thiocyanate, and a dust of 325-mesh sulfur undiluted except for conditioning gave poor control or none. A 1-percent DDT spray, a commercial 3-percent DDT dust, and a pyrethrum (1.25 percent pyrethrins) showed promise.

O falso exantema dos citruss [*False exanthema of citrus*], A. A. BITANCOURT (*Biológico*, 11 (1945), No. 10, pp. 266-268, illus. 1).—A brief note on this disease occurring in the State of São Paulo, Brazil, with illustrations of the leaf and stem symptoms.

Spray injury from zinc-lime sulfur in central California, H. C. LEWIS (*Calif. Citrog.*, 31 (1946), No. 4, p. 112, illus. 2).—It is concluded from the results of experiments in two California orange groves, as well as from general field experience, that zinc oxide should not be added to the spring lime-sulfur spray applied following blossom petal fall in this area. If zinc with lime-sulfur is desired for use at this time it is recommended that $ZnSO_4$ be employed at the rate of 7 lb. per 100 gal. with the 2 percent lime-sulfur for thrips control.

Diseases of the filbert in the Pacific Northwest and their control, P. W. MILLER. (Coop. U. S. D. A.). (*Oregon Sta. Bul.* 428 (1945), pp. 24, illus. 17).—This bulletin provides the grower with information that should enable him to identify the various diseases affecting filberts in the Pacific Northwest and to employ control measures insofar as known.

Variability of *Pythium ultimum* from guayule, W. A. CAMPBELL and B. SLEETH. (U. S. D. A.). (*Mycologia*, 38 (1946), No. 1, pp. 24-39, illus. 2).—On the basis of relative abundance of oospores and sporangia (chlamydospores) on Difco corn meal agar, 121 isolates of *P. ultimum* from diseased guayule seedlings were classified into 3 types. Three isolates producing mainly oospores were classified as type O; 71 producing oospores and few to many sporangia, as type OS; and 47 producing only sporangia, as type S. From each of 25 selected isolates, 20 hyphal-tip subcultures were taken. Subcultures from 3 O, 11 OS, and 7 S types were similar to the parent cultures; those from 4 OS isolates segregated into 2 giving types O and S subcultures and 2 giving types OS and S, indicating that these 4 isolates were either mixed cultures or unstable in type. In an effort to induce S-type isolates to produce oospores they were grown on 6 different media, none of which stimulated their formation. Five O-, 13 OS-, and 11 S-type hyphal-tip subcultures of 25 isolates were found to have very similar growth rates on corn meal agar at constant temperatures of 10°, 15°, 20°, 25°, 30°, 35°, and 40° C.; the optimum for mycelial growth was 25°-30°. Emerging guayule seedlings in the greenhouse were used to test the pathogenicity of 26 hyphal-tip subcultures, which included 4 O, 13 OS, and 9 S types; all were pathogenic and of comparable virulence in causing preemergence loss to the seedlings. Most hyphal-tip or single-spore subcultures of *P. ultimum* isolates were, in general, stable as to type; one isolate, however, readily gave rise to other types. Successive hyphal-tip transfers of a hyphal-tip subculture of 980 of the OS type gave rise to both O and S types, as well as to the parent type. Three generations of single-spore (sporangium) subcultures from 2 isolates of OS type were all like the parent; a single-spore generation of 2 S-type isolates were also all of the parent type.

Black mold disease of Manetti rootstock, J. A. MILBRATH. (Oreg. State Col.). (*Amer. Nurseryman*, 83 (1946), No. 1, pp. 5-6, illus. 2).—This disease—caused by *Chalaropsis thielavioides*—has been reported as responsible for considerable damage to a number of different plants of interest to nurserymen. In growing the Manetti variety of rose for rootstocks certain precautions against black mold are suggested, including the prevention of infection of the cuttings and examination of all cuttings just before planting and, if found infected, treatment with Ceresan. Where the

fungus has been present, storage house walls, ceilings, floors, and equipment should be thoroughly sprayed with or dipped in CuSO_4 solution. The fungus does not develop on active growing tissue; it is thus doubtful whether the mother blocks from which cutting wood is taken would ever be infected. Infection has been found in the storage house from spores developing on infected rooted cuttings, dormant buds, or 2-year-old roses on Manetti roots; Multiflora rootstock is said to be nonsusceptible to black mold.

The problems of forest pathology in Quebec, R. POMERLEAU (*Forestry Chron.*, 21 (1945), No. 4, pp. 267-280).—To gain a proper insight into the problems of tree diseases and other losses resulting from pathological causes in the Province of Quebec, it is deemed essential to have at least a view of the present forest status within the area. This information the author attempts to give. There are over two pages of references.

Dutch elm disease controlled by cleanup of breeding areas, D. S. WELCH. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, pp. 11-12, illus. 1).—Studies begun in 1934 indicated that both the fungus cause and the insect carrier could thrive and reproduce in dead elm wood from healthy trees. The fungus may be present in association with the vector even in regions where diseased trees have not yet appeared. Attention should thus be focused more on elm wood of any kind suitable for breeding elm bark beetles than on affected trees in newly invaded regions. Removal of such material from within 500 ft. of valuable trees before May 1 of each year is said to be the best method now known for protecting elms from the Dutch elm disease. A brief history of the disease in the United States and a note on the virus-induced phloem necrosis of elms are included.

Pine killing by the root fungus, *Fomes annosus*, in California, W. W. WAGENER and M. S. CAVE. (U. S. D. A.). (*Jour. Forestry*, 44 (1946), No. 1, pp. 47-54, illus. 2).—A root fungus *F. annosus* was shown to be the primary cause of death in ponderosa and Jeffrey pines of all ages in the easterly portion of the California pine region; sugar and Coulter pines may also be killed. The fungus is a source of serious losses among conifers in Europe, but though common has not hitherto been so regarded in the United States. The disease spreads from an initial center—usually a stump or snag—to surrounding trees through contact of overlapping root systems, forming a roughly circular opening in stands on level ground. It is confined almost entirely to light sandy soils in the drier parts of the pine belt. Killing extends very little above ground. Trees fading from the infection are usually invaded by bark beetles and then resemble those killed primarily by these insects. Roots initially attacked by the fungus become heavily infiltrated with resin. Fruit bodies are rarely formed on attacked pines. After a tree dies the fungus remains active as a wood-rotting organism in the roots and butt. A full appraisal of the status of the parasite as a killing agent in western pine stands has not yet been made; it is expected to increase in importance.

Canker stain of planetrees, J. M. WALTER (U. S. Dept. Agr. Cir. 742 (1946), pp. 12, illus. 6).—During the past half century London plane (*Platanus acerifolia*)—the most seriously affected species—has become one of the most important shade trees of the United States and has been extensively planted in an eastern and central region including New York City, Pittsburgh, Washington, Roanoke, and St. Louis. Canker stain—caused by a fungus of the genus *Endoconidiophora*—has killed thousands of planetrees within this area. The fungus is readily transmitted by man especially in pruning operations, but its dissemination by natural means is of little moment; the disease is thus far more important on city shade trees than in the forest. It is unusually well characterized by blackened elongate cankers having annual zones 0.5 to 2 in. wide, beneath which the wood exhibits reddish-brown to

bluish-black discoloration distinctively distributed in the medullary rays. Experiments carried out over a 5-yr. period showed that the disease can be controlled by relatively simple, inexpensive, and practicable measures. Those recommended include removal of all diseased trees or parts of trees, avoidance of unnecessary mutilation of the trees, disinfection before use of all tools and other equipment that has been in contact with an infected tree, use—when wound dressing is needed—of a gilsonite varnish (type covered by Federal Specification TT-V-51) in which 0.2 percent of phenylmercury nitrate has been mixed, and, insofar as possible, restriction of pruning from December 1 through the first half of February.

Canker of hybrid poplar clones in the United States, caused by *Septoria musiva*, A. M. WATERMAN. (U. S. D. A. et al.). (*Phytopathology*, 36 (1946), No. 2, pp. 148-156, illus. 1).—Certain clones of hybrid poplars particularly adaptable for pulpwood reforestation were found susceptible to a serious disease caused by *S. musiva* and observed in plantings at Attica and Saratoga Springs, N. Y., and at Norris, Tenn. Infection occurs through twig wounds or uninjured leaves. On the most susceptible trees, growth of the fungus into the main stem results in the formation of cankers that eventually girdle it and thus cause the trees to die. Cankers on less susceptible trees may become infected with secondary fungi, such as *Cytospora*, which grow more rapidly than the *Septoria* and tend to mask its presence. *S. musiva* is indigenous to North America and is widespread as a leaf parasite on various species of native and exotic poplars. Cankers have been reported previously only on exotic and hybrid poplars in Canada and Argentina. Inoculations proved the high susceptibility of one clone with a parentage of *Populus nigra* × *P. laurifolia*, two of *P. maximowiczii* × *P. berolinensis*, and one of *P. maximowiczii* × *P. nigra plantierensis*. Clone OP-55 (*P. candicans* × *P. berolinensis*) was resistant to leaf, petiole, and stem inoculations.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Papers on zoology] (*Pa. Acad. Sci. Proc.*, 19 (1945), pp. 49-60, 65-79, illus. 3).—The following are included: A Key to the Genera of Rodents Found in Pennsylvania Based on Skull and Mandible Characteristics, by G. R. L. Gaughran (pp. 49-57); Some Birds of Bedford County, Pennsylvania, by T. H. Knepp (pp. 58-60); Sex Ratios of Bats in Pennsylvania, by C. E. Mohr (pp. 65-69); and *Aegistrodon mokeson mokeson* (Daudin) [Northern Copperhead] in Pennsylvania (pp. 69-72) and The Amphibians and Reptiles of Westmoreland County, Pennsylvania (pp. 72-79), both by A. G. Smith.

Briefer articles (*Jour. Wildlife Mgmt.*, 10 (1946), No. 1, pp. 66-73, illus. 3).—The following are included: Reactions of Young Birds to Atmospheric Humidity, by V. E. Shelford and L. Martin (pp. 66-68) (Univ. Ill.); Muskrats of Tule Lake Refuge, California, by C. A. Sooter (pp. 68-70); Parasites of Ohio Muskrats, by R. L. Rausch (p. 70) (Ohio State Univ.); Box Trap for Snowshoe Hares and Small Rodents, by C. M. Aldous (pp. 71-72); Effect of High Explosive Bombing on Fish, by C. R. Eklund (p. 72); and Possible Increase in Post-War Hunting, by W. E. Scott (pp. 72-73).

Management of black-tailed deer, A. S. EINARSEN. (Oreg. Expt. Sta. et al.). (*Jour. Wildlife Mgmt.*, 10 (1946), No. 1, pp. 54-59, illus. 4).—This species can live in comparative security in circumscribed areas, making it the most desirable big game in the Oregon Coast Range; it requires careful but simple management. Protection of remnant stock after forest fires is essential. The experiences gained in the Tillamook Burn showed the practicability of a temporary refuge to improve hunting. The vegetative succession following a forest fire on such range provides abundant deer foods of excellent quality, as indicated by weights of the animals. The neces-

sary protection period is comparatively short; a closure from October 1939 to October 1942 resulted in increases averaging from less than 1 to more than 15 deer per section of land. Inspection of deer carcasses killed by hunters showed them to be free from injurious parasites—a direct result of the fire.

Palatability ratings of Black Hills plants for white-tailed deer, R. R. HILL. (U. S. D. A.). (*Jour. Wildlife Mgmt.*, 10 (1946), No. 1, pp. 47-54, illus. 1).—Stomach samples of 319 animals killed in this South Dakota area during 1941-44 were analyzed, and the percentages of the plant species were compared with percentages available as shown by range analyses. The ratio of utilization to availability was then used to express the palatability ratings. Seasonal preferences varied greatly, necessitating the selection of key species to fit the period concerned. The winter of 1943-44 was unusually severe, and many deer died of malnutrition. Since they did not thrive on plants of low palatability and made no use of unpalatable plants, it was concluded that the latter should be given no weight, and those of low palatability little if any, in calculating range carrying capacity.

Summer browsing by deer on cut-over hardwood lands, D. B. COOK (*Jour. Wildlife Mgmt.*, 10 (1946), No. 1, pp. 60-63).—On recently clear-cut hardwood forest land in Rensselaer County, N. Y., white-tailed deer exhibited marked selectivity in summer feeding. New sprouts of gray birch, hard maple, and white ash and of several less abundant species were heavily fed upon, other trees and shrubs being lightly used or ignored. Small seedling trees were definitely less attractive than new sprouts of the same species. Where such cut-over land is being converted by planting conifers, deer browsing may be of some assistance in keeping down the hardwood sprouts. Where regeneration is being sought by any method involving substantial opening of the forest canopy, hardwood reproduction will usually be so abundant that damage by deer is of little consequence.

A problem of "antler room," P. M. SCHEFFER and R. M. BOND (U. S. Dept. Agr., *Soil Conserv.*, 11 (1946), No. 7, pp. 161-166, illus. 7).—This article is based on factual information obtained from a technical survey report prepared in 1944 by the U. S. D. A. Soil Conservation Service at the request of the Wenas Valley Soil Conservation Board of Supervisors, Washington State. It shows how 57 elk introduced by a group of sportsmen in 1913 have now increased to a number around 6,000 individuals—now known as the Yakima elk herd—with the consequent erosion, deterioration of the range areas, damage to ranch lands, fence lines, and haystacks and even the effects of the reduced feed supply on the elk themselves. It is concluded that the impact of grazing on the Yakima elk herd, if continued at the present rate of use, can lead only to one thing—disaster to the elk, to the domestic livestock, and to the range itself. Certain steps in a management program already undertaken in the Wenas Valley have pointed out the way to a conservation of the soil resources of the area.

Habits of coyotes in destroying nests and eggs of waterfowl, C. A. SOOTER (*Jour. Wildlife Mgmt.*, 10 (1946), No. 1, pp. 33-38, illus. 9).—Destruction of waterfowl nests and eggs by coyotes on the Malheur National Wildlife Refuge, Oregon, is said to vary as to pattern. At times it is difficult to distinguish damage by coyotes to eggs from that done by birds. At times coyotes bury eggs taken from nests they have located.

Fur resource management in British Columbia, C. R. EKLUND (*Jour. Wildlife Mgmt.*, 10 (1946), No. 1, pp. 29-33).—The registered trap-line system employed for 19 yr. has proved an excellent fur resource management practice but requires an extensive territory. Trap lines usually follow streams or lakes with watersheds as outer boundaries; there is a 1-mile reserve between boundaries of adjacent lines. Every trapper submits a return form. Overtrapping is indicated by fluctuations in annual takes and confirmed through investigation by a warden. Poaching

of beaver has occurred, but is considerably reduced by a regulation requiring all pelts to be officially marked before sold. Annual returns indicate a conspicuous increase in populations of fox, mink, and muskrat in recent years as compared with a similar period at the start of the system in 1926. Registered trappers have to a certain degree become fur farmers, and the majority desire to protect and build up their fur populations and to crop off only the surplus.

Live trapping and tagging muskrats, S. E. ALDOUS (*Jour. Wildlife Mangt.*, 10 (1946), No. 1, pp. 42-44, illus. 2).—Findings from studies in a South Dakota wildlife refuge (1943-44) suggested the need for information on movements of the animals during winter. To accomplish this, 367 muskrats were live-trapped, ear-tagged, and released during the summer of 1944. Of these, 251 entered the traps once, 80 returned for a second capture (8 dying in the traps), and 24 returned for a third and 8 for a fourth capture; 3 of the 4 returning a fifth time died. The fingerling tag was applied successfully to the ears even of young weighing only 4 oz. Use of a conelike holding cage permitted the animals to be handled without injury, both hands being free to apply the tag, examine for sex, and weigh the animal.

Variation in pattern of primeness of muskrat skins, C. E. KELLOGG (*Jour. Wildlife Mangt.*, 10 (1946), No. 1, pp. 38-42).

The cottontail rabbits of Virginia, L. M. LLEWELLYN and C. O. HANDLEY. (Va. A. and M. Col. et al.). (*Jour. Mammal.*, 26 (1945), No. 4, pp. 379-390, illus. 2).—Five races of these important game animals belonging to three species occur in Virginia and are discussed in detail. One of them, *Sylvilagus floridanus mearnsi*, is reported for the first time. *S. transitionalis* is found on the higher mountain peaks, and *S. palustris* occurs in the Dismal Swamp region. In transplanting cottontails from one section to another, it is recommended that only those of the same race as those originally present be released. Tularemia was not found to be common among rabbits in the State, but rabbit ticks are often carriers of the disease and may transmit it to them; these ticks are also carriers of Rocky Mountain fever and American Q fever. After the ticks drop off to hibernate in the ground—usually in midwinter—there is said to be relatively little danger of contracting tularemia by contact with rabbits. It is recommended that as a public health measure the taking of cottontails be completely prohibited to all until the opening of the general hunting season.

Incidence and transmission of Sarcocystis in cottontails, A. B. ERICKSON. (Minn. Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 10 (1946), No. 1, pp. 44-46).—A brief note and review (8 references).

The spring molt of the northern red squirrel in Minnesota, B. A. NELSON (*Jour. Mammal.*, 26 (1945), No. 4, pp. 397-400).

"1080" rat poison effective but dangerous, J. W. SCALES (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 12, pp. 1, 8).—A note on the acute dangers to other animals from the new rodenticide sodium fluoroacetate.

Some aspects of the life history and ecology of the opossum in central Missouri, H. C. REYNOLDS. (Univ. Mo. et al.). (*Jour. Mammal.*, 26 (1945), No. 4, pp. 361-379).—During this study 116 opossums were captured with the aid of dogs, and 27 were live-trapped, found freshly killed, or received from other sources. The breeding season in central Missouri was found to extend approximately over February-September; 2 litters per season were usual and there was no indication of a third. The young in 42 litters averaged 8.9; the largest was 13 and the smallest 5. The sex ratio among 120 individuals obtained alive was 55 ♂ to 45 ♀; that of 1,076 animals sold to fur dealers was 58 ♂ to 42 ♀. The descending frequency of occurrence of the various food classes in 259 scats collected from animals (September to May) was insects, fruits, other invertebrates, mammals, reptiles, cultivated grains and miscellaneous seeds, and birds and their eggs; the order by volume of the

contents of 68 stomachs (December to May) was insects, mammals, reptiles, grains and miscellaneous seeds, fruits, birds and their eggs, and other invertebrates. Of 45 opossum dens discovered, 23 were in caverns of rocky slopes, 4 in ground burrows of woodchucks, 5 in trash heaps, 3 each in squirrel nests, hollow trees, and under farm buildings, 2 in horizontal logs on the ground, 1 under a beehive, and 1 in a tree-nest apparently constructed in part at least by the opossum occupying it. Most opossums are apparently nomadic. During December 1941–January 1942 (mean temperature 41° F.) the sex ratio among 686 individuals taken by hunters and trappers was 52 ♂ to 48 ♀; during the rest of the hunting season (mean temperature 24°) the ratio among 390 individuals was 68 ♂ to 32 ♀. This is believed to indicate a decrease in ♀ activity during cold weather. It appears likely that the proximity of water is a factor important to suitable opossum range. The American dog tick and a flea species were the only external parasites found; two nematode species were observed—one in the stomach and the other in the cecum. There are 20 references.

The status of certain species of birds on the Lake Carl Blackwell Project, F. M. BAUMGARTNER. (Okla. A. and M. Col.). (*Okla. Acad. Sci. Proc.*, 25 (1945), pp. 24–26).—Notes and tabulations on bird population changes over 6- to 7-yr. periods in this Oklahoma area.

Alternative methods in upland gamebird food analysis, A. C. MARTIN, R. H. GENSH, and C. P. BROWN (*Jour. Wildlife Mgmt.*, 10 (1946), No. 1, pp. 8–12).—The authors compare two methods currently used for making final summaries of data obtained from analyzing food in crops and gizzards of upland game birds.

Names of age groups of young birds, H. B. WOOD (*Bird-Banding*, 17 (1946), No. 1, pp. 27–33).—In view of the various expressed opinions cited and other study, definitions are submitted of the nestling, fledgling, juvenile, immature, and young age groups of birds.

A method of determining the age of live passerine birds, A. H. MILLER (*Bird-Banding*, 17 (1946), No. 1, pp. 33–35, illus. 2).

Improving conditions for migratory waterfowl on TVA impoundments, A. H. WIEBE (*Jour. Wildlife Mgmt.*, 10 (1946), No. 1, pp. 4–8).—Fluctuations in water level in a managed area (e. g., TVA), especially the draw-down for food control, imposes serious limitations on a program for managing migratory waterfowl. Limited developments for ducks are possible through use of some agricultural crops as duck food, summertime dewatering, and maintenance of constant-level pools.

The canvas-back in Minnesota, J. D. SMITH (*Auk*, 63 (1946), No. 1, pp. 73–81).—This study was conducted as part of a series of investigations of the migratory game birds of the State. It concerns the history of the species in Minnesota, the spring migration, courtship, sex ratios, nesting, fall migration and hunting, and the sex and age of birds in hunters' bags.

Food of Maine ruffed grouse by seasons and cover types, C. P. BROWN. (Univ. Maine et al.). (*Jour. Wildlife Mgmt.*, 10 (1946), No. 1, pp. 17–28).—The study was based on 265 birds collected during October 1941–September 1943. The correlation between food availability and usage was highest in the old field and orchard type of habitat, which offered a minimum of shelter and was frequented primarily for feeding. The correlation was lowest where softwoods predominated; these offered maximum shelter and were used mainly in adverse weather or for resting. The principal foods taken in each cover were (1) mixed growth types—aspens, hazelnut, clover, willow, and wild cherry; (2) upland hardwoods—aspens, clover, wintergreen, birch, and hazelnut; (3) lowland hardwoods—aspens, willow, hazelnut, apple, and clover; and (4) old fields and orchards—apple, hawthorn, and sumac. In Maine, grouse fed largely on catkins and buds in winter and early

spring; on fruit, leaves, and insects in summer; and on leaves, fruit, catkins, and buds in fall. Aspen was the most important single year-round food, others being hazelnut, apple, and clover; wintergreen occurred among the most important foods for each season except winter, when it was eleventh.

Nutrient content of some winter foods of ruffed grouse, R. TREICHLER, R. W. Srow, and A. L. NELSON (*Jour. Wildlife Mgmt.*, 10 (1946), No. 1, pp. 12-17).—During late winter, 17 preferred grouse foods were collected and analyzed for nutrient content, the results including moisture, crude protein, ether extract, crude fiber, N-free extract, ash, Ca, P, and gross energy content expressed on both moisture-free and fresh bases. The preferred winter foods were found to be characterized by high contents in dry substance and N-free extract. On the basis of nutrient content the foods examined are considered well qualified as sources of energy and other essential nutrients required for maintenance of grouse during the winter season.

Mourning doves in Nebraska and the West, H. E. McCURE (*Auk*, 63 (1946), No. 1, pp. 24-42, illus. 1).—This report of studies of the habits of *Zenaidura macroura* covers records of 4,273 nestings; data from Iowa and Nebraska are compared and contrasted throughout the paper. A method of determining dove population indexes by use of the number of nests counted in sample areas is discussed; factors showing the ratio of active nests to the season's total nest production proved similar for both States.

Reptiles, good and bad, W. A. MURRILL (*Gainesville, Fla.: Author*, 1945, pp. 32).—A popular account.

Management of a small fish pond in Texas, K. BONHAM (*Jour. Wildlife Mgmt.*, 10 (1946), No. 1, pp. 1-4).—Undesirable concentrations of poison bean and water primrose were removed from a 0.5-acre pond by hand and had not returned in objectionable degree after 16 mo. Poisoning with 0.5 p. p. m. of cube root (4 to 5 percent rotenone) killed all fish except *Gambusia affinis*; the population of 9 years' standing yielded 107 lb., the make-up of which is detailed. The pond was then stocked with fingerlings—49 of bluegill and 17 of largemouth bass. In a year the bass grew to weigh 1 lb. but failed to spawn; the bluegills spawned in less than 8 mo. and continued to do so for the rest of the winter and spring. Of the abundant small crayfish present, 40 percent of a sample contained bluegill fry; they therefore had effected a desirable reduction in the bluegill population.

[Abstracts and brief papers on economic zoology and entomology] (*Tex. Acad. Sci. Proc. and Trans.*, 28 (1944), pp. 97-98, 100-102, 104-105, 112-117, 195-196, 227-232).—The following are included: A Probable Agent for the Transmission of Fowl Paralysis, by J. C. Brown (pp. 97-98); Bark Beetles of the Pines of Stephen F. Austin State Teachers College, by R. G. Upton (pp. 100-102); U. S. Public Health Service Standards for Rodent Control Aid, by C. A. Nau (pp. 104-105); Dengue Fever Mosquito Control at Galveston, Texas, by H. B. Morlan (pp. 112-117); Results of Seven Years of Planned Fish-Improvement in an East Texas Lake, by B. B. Harris (p. 195); Fish Growth and Age in Certain Texas Lakes, by J. K. G. Silvey (pp. 195-196); A Brief Chronology of Wildlife Conservation in Texas, by D. W. Lay (p. 196); and Use of Gypsum in Agriculture [Insecticidal and General Agricultural Applications], by K. L. Michel (pp. 227-232).

[Papers on crop pests] (*Iowa State Hort. Soc. [Rpt.]*, 79 (1944), pp. 89-96, 107-121, illus. 1).—The following are included: Developments in Insecticides for Codling Moth Control (pp. 89-96) and Codling Moth Control (pp. 107-116), both by B. A. Porter (U. S. D. A.); and Apple Maggot or Railroad Worm in Iowa (pp. 116-119) and Ten Years of Codling Moth Bait Trapping (pp. 119-120), both by H. Gunderson (Iowa State Col.).

[Brief papers on insects] (*Okla. Acad. Sci. Proc.*, 25 (1945), pp. 21, 28-33, illus. 2).—The following are included: Growing Silkworms (*Bombyx mori*) for Victory and Peace, by M. M. Boyer (p. 21); and Distribution of the Southwestern Corn Borer in 1944, by R. R. Walton (pp. 28-29), and Variations of Codling-Moth Infestations in Apple Varieties, by F. E. Whitehead (pp. 30-33) (both Okla. Expt. Sta.).

[Papers on entomology] (*Pa. Acad. Sci. Proc.*, 19 (1945), pp. 24-48, illus. 1).—The following papers are presented: A symposium on insect problems in Pennsylvania, including an introductory paper by T. L. Guyton (pp. 24-26), Classified Collections of Insects, by A. B. Champlain (pp. 26-30), and Teaching Entomology, by S. W. Frost (pp. 30-33), Insect Control in Pennsylvania, by J. O. Pepper (pp. 33-34), and Insects in Relation to Public Health, by V. R. Haber (pp. 35-38) (all Pa. State Col.); Two New Races of North American Butterflies [*Papilio cressphontes pennsylvanicus* and *Euphydryas colon sperryi*], by F. H. and R. L. Chermock (pp. 38-40); Notes on the Life Histories of Some Floridian Butterflies, by R. L. Chermock (pp. 40-43); and The Coccidae or Scale Insects of Pennsylvania [including lists of genera and species and of species with host plants], by G. B. Slesman (pp. 43-48).

An annotated check-list of the more important entomological periodicals, E. S. CLAASSEN. (Cornell Univ.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 403-411).

Entoma: A directory of insect and plant pest control, 1945, edited by G. S. LANGFORD (New Brunswick, N. J.: Amer. Assoc. Econ. Ent., East. Branch, 1945, 6. ed., pp. 320+).—The sixth edition of this directory (E. S. R., 90, p. 218).

The theoretical aspect of insect metamorphosis, H. HENSON (*Biol. Rev. Cambridge Phil. Soc.*, 21 (1946), No. 1, pp. 1-14, illus. 4).

Recent developments in the study of the insect cuticle, R. DENNELL (*Roy. Col. Sci. [London], Sci. Jour.*, 15 (1945), pp. 92-98, illus. 2).—A lecture reviewing the subject, with 17 references.

Female assembling scents with reference to an important paper on the subject, H. B. D. KETTLEWELL (*Entomologist*, 79 (1946), No. 992, pp. 8-14).—Since 1928 the author has "undertaken many hundreds of experiments of different sorts on assembling moths both in the field and under artificial conditions. Altogether about 50 different species have been used at different times." He here summarizes briefly his results under the mechanism of assembling, the ♂ antenna, electrical effects, and isolation of ♀ scents. He concludes that it has been proved for the first time that the assembling stimulus is a chemical substance which is volatile and can be isolated in pure state, but believes it likely that only a small quantity is manufactured by the ♀ at a time, the bulk being kept in a precursor state. The implications of these findings to various phases of entomology are noted.

Insect dietary: An account of the food habits of insects, C. T. BRUES (Cambridge: Harvard Univ. Press; London: Oxford Univ. Press, 1946, pp. 466+, illus. 100).—Following an introductory section on the abundance and diversity of insects and on types of food habits and their relation to structure and environment, the main body of the volume takes up vegetarianism (herbivorous insects, gall insects, and fungi and microbes as food and symbiosis with micro-organisms) and carnivorism (predatory insects, parasitism, blood-sucking insects and other external parasites, entomophagous parasites and other internal parasites, and insects as food for man and other organisms). Copious bibliographies terminate each of the 10 chapters, and subject and author indexes are provided.

A measure of the influence of natural mortality factors on insect survival, H. A. BESS. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 4, pp. 472-481).—Mortality percentages are said to be inadequate as such for appraising and comparing mortality factors as control agents for insects. Mortality : survival

ratios may be useful measures of the relative effects of control agents in reducing insect populations; such ratios, as determined for one or more factors causing mortality in two or more insect developmental stages, can be combined readily to procure an estimate of the total effect produced by the factor or factors involved. In studies to determine the relative effects of different mortality factors in regulating insect populations, the population density should be determined as frequently as practical. Estimates of the proportion of the population killed or affected by a particular factor are often obtained, however, without procuring an estimate of the population density. Mortality : survival ratios derived from estimates of the proportion of the population killed may indicate the relative effects of different factors in reducing the abundance of an insect in a single generation, even though no estimates are obtained of the population of the insect when the factor or factors operated. Even though the interaction of mortality factors complicates the problem of appraising and comparing different factors as reduction agents, estimates of the relative reduction effects of them can be procured by a technic described and illustrated in tabular form.

Further experiments on insect competition, A. C. CROMBIE (*Roy. Soc. [London], Proc., Ser. B, 133 (1946), No. 870, pp. 76-109, illus. 10*).—In these further studies (E. S. R., 93, pp. 317, 466) the growth of populations of the confused flour beetle and the saw-toothed grain beetle was observed in media of wheat and coarse and fine whole-meal flours; these were maintained at a constant level by periodic transference of the insects to equal amounts of fresh media. Population growth was best observed in fine flour, from which all stages could be sifted out and counted. In populations of each species beginning with two adult ♂ and two ♀, maxima for eggs, larvae, and pupae succeeded each other and finally adults emerged and themselves rapidly rose to a maximum. The adult populations remained steady at the maximum, whereas egg, larval, and pupal populations fluctuated around mean values. The rate of population growth was determined by the rates of oviposition and development on the one hand and of cannibalism on the other. Such cannibalistic eating of eggs and—more important—of pupae by adults and larvae, rather than limitations of food, also determined the maximum population size. Comparisons of rates of oviposition with the rates at which adults emerged indicated that in such populations the mortality in the immature stages was over 99 percent.

In competition with *Oryzaephilus*, which depended entirely on mutual predation, *Tribolium* had the advantage because of its greater voracity. The former was driven out of the flour media, which failed to protect the pupae; when, however, the flour media contained glass tubing allowing the larvae to enter and pupate but excluding *Tribolium* adults and large larvae, *Oryzaephilus* survived together with *Tribolium* just as it did in wheat. In wheat, the lesser grain borer survived along with *Tribolium*, and all three species also survived together in this medium. The results of these competitions support the contention that species with the same needs and habits are unable to survive together in the same environment, whereas species differing in needs or habits may do so. The position at which equilibrium between any two of the competing species was reached was independent of the initial density of each species. When constants of the Lotka-Volterra simultaneous equations for the population growth of two species competing for the same limited environment were calculated from the experimental data, they led to inequalities corresponding to definite equilibrium positions for these equations. The actual equilibrium positions reached by the populations were in every experiment the same as those reached by the equations; the biological assumptions on which these equations are based were not, however, strictly true for *Tribolium* and *Oryzaephilus*. Populations living in unrenewed flour rose to a maximum and then declined as the food became exhausted and "conditioning" increased. As time passed, the age composition shifted from a

majority of young stages to a majority of adult stages. The extinction of the *Tribolium* population was due to failure of the larvae to develop and pupate and of the *Oryzaephilus* population to do this as well as to the cessation of oviposition. The adults, having failed to reproduce themselves, eventually died. There are 55 references.

Microtechniques used to study action of insecticides, R. L. PATTON. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, pp. 2-3).—This article stresses the value of laboratory research on the action of toxic substances in connection with the development of improved insecticides.

Some recent developments in insecticides, H. D. TATE. (Univ. Nebr.). (*Amer. Assoc. Cereal Chem. Trans.*, 4 (1946), No. 2, pp. 37-43).—The recent advances included in this brief summary are DDT, Gammexane (benzene hexachloride), repellents, new methods of application, thiocyanates, dinitro derivatives, and sabadilla.

Commercial insecticides and fungicides in Texas, 1944-1945, J. E. McDONALD and G. S. FRAPS (*Texas Sta. Cir.* 108 (1945), pp. 15).—The usual analyses are listed.

[DDT and other sprays] (*Va. Fruit*, 34 (1946), No. 1, pp. 119-122, 128-153).—The following papers are included: Incompatibility of Fungicides With DDT, by R. R. Hurt (pp. 119-122), and Results of Tests With DDT on Apples in 1945 and Suggestions for Its Use in 1946, by W. S. Hough (pp. 128-134) (both Va. Expt. Sta.); and Comparisons of Phenothiazine and DDT in Handling Orchard Pests Among Heavy Codling Moth Infestations of Pennsylvania, by H. M. Steiner (pp. 135-153) (Pa. Sta.).

Present status of DDT as an insecticide, I, II, J. T. CREIGHTON. (Univ. Fla.). (*Citrus Indus.*, 26 (1945), No. 12, pp. 5-7, 22; 27 (1946), No. 1, pp. 5-9, 16-17).—An address, with 42 literature references.

Hexachlorocyclohexane as an insecticide, S. ROGERSON (*Nature [London]*, 156 (1945), No. 3962, p. 424).—A note on the use of this insecticide in Britain during the war.

New species and previously undescribed naiads of some Minnesota mayflies (Ephemeroptera), R. H. DAGGY. (Minn. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 373-396, illus. 12).

The relative edibility and behaviour of some aposematic grasshoppers, G. D. H. CARPENTER (*Ent. Mo. Mag.*, 4, ser., 7 (1946), No. 73, pp. 5-10).

The rectal sac of the red-legged grasshopper (*Melanoplus femur-rubrum* DeGeer), W. S. MARSHALL. (Univ. Wis.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 4, pp. 461-471, illus. 18).—A histological study.

Mass departure of locust swarms in relation to temperature, D. L. GUNN, F. C. PERRY, W. G. SEYMOUR, T. M. TELFORD, E. N. WRIGHT, and D. YEO (*Nature [London]*, 156 (1945), No. 3969, pp. 628-629).—Experimental data presented led to the conclusion that mass departure of the desert locust *Schistocerca gregaria* (Forsk.) is apparently correlated with the air temperature rather than the body temperature; thus other factors affecting it can be studied with a simple hygrometer, the expensive apparatus and skill required for taking body temperatures being unnecessary.

A list of the generic and subgeneric names of Dermaptera, with their genotypes, H. K. TOWNES. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 343-356).

Estudios sobre Tisanópteros de España.—I. Haplothrips cottei (Vuillet), especie polimorfa (Thysanoptera: Phloeothripidae) [A polymorphous species of thrips], J. DEL CAÑIZO (*Eos [Madrid]*, 20 (1944), No. 1-2, pp. 101-122, illus. 11).

Classification of the Enicocephalidae (Hemiptera: Reduviioidea), R. L. USINGER. (Univ. Calif.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 321-342, illus. 3).—Though primarily a taxonomic study of this family—the unique-headed bugs—the

general history, biology, and morphology of the group are also briefly considered. A key to the genera and a bibliography of nearly two pages are included.

Supplementary notes on ten described species of Lachnini (Aphidae), M. A. PALMER (Colo. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 447-453, illus. 9).—The author here adds some important details to several previously published descriptions of aphids in the genera *Cinara* and *Eulachnus*.

The use of flight traps in the study of aphid movement, R. P. GORHAM (*Acadian Nat.*, 2 (1946), No. 6, pp. 106-111).—A preliminary report is presented on the use of traps for studying flight movements of aphid species infesting potato plants. Records—beginning in 1941—are given of the number of traps employed in each section of the Maritime region of Canada and of the insects caught to the end of 1944.

A new genus and species of South American leafhopper belonging to a new tribe of the Jassinae, D. M. DELONG (Ohio State Univ.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 414-416, illus. 3).—*Sandersellus carinatus* n. gen. and sp. are described.

Recent light trap catches of Lepidoptera in U. S. A. analysed in relation to the logarithmic series and the index of diversity, C. B. WILLIAMS (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 357-364, illus. 3).

A catalogue of the parasites and predators of insect pests.—Section 1, Parasite host catalogue, VI (Belleville, Ont.: *Imp. Parasite Serv.*, 1945, sect. 1, pt. 6, pp. 131-258+).—This part continues the listing of parasites of the Lepidoptera by host species (Ci-F) (E. S. R., 93, pp. 312, 601).

The combined effects of genetic and environmental variations upon the composition of *Colias* populations, W. HOVANITZ (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 4, pp. 482-502, illus. 6).—Five pigment factors and two iridescent colors combine to form the wing pattern of the butterfly *C. chrysotheme*. One pigment—melanin—is black; the others—pterines—range in four grades from white through yellow and orange to red. One iridescent color is silver and the other violet. The part played by these colors in forming the wing pattern is described. The range of variation in each of the pattern elements is indicated; various environmental and genetical agents influence the manifestation of these different elements. The actions of the different agents may be either general or specific on the manifestation of color; furthermore, these agents may influence the same pigment in the same or in different ways. High humidity and high irradiation during development result in good manifestation of all pigments. Temperature is selective rather than general in its action. The effects of a slowed up development rate are the same as those of a low temperature. The relative influences of heredity and environment in shaping the phenotype of a wild butterfly can be deduced from the characteristics which it displays. The effects in combination of the environmental and genetical influences lead to predictable variations that are found in wild populations. There are 19 references.

A contribution to the biology of *Dolopius marginatus* L. (= *Depressus* Esch.) (Col.: Elateridae), D. R. ARTHUR (*Ent. Mo. Mag.*, 4, ser., 7 (1946), No. 73, pp. 1-4, illus. 1).—Observational notes on the life history and habits of this wireworm species in Britain, including predation by birds, moles, and other insects.

The derivation of Hymenoptera, R. K. NABOURS. (Kans. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 4, p. 457).—An etymological note on the term "Hymenoptera."

Two common ponerine ants of possible economic significance, *Ectatomma tuberculatum* (Olivier) and *E. ruidum* Roger, N. A. WEBER (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 1, pp. 1-16; illus. 10).—It is suggested that both these species should be considered of possible significance to agriculture; their role is difficult

to evaluate precisely, but they often tend homopterous insects and probably transport fungus and other pests as they go from plant to plant. The author brings together the known citations of these two insects, gives many additional locality records, discusses their taxonomy, and describes their biology.

Population studies of the ant *Myrmica schencki* ssp. *emeryana* Forel, M. TALBOT (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 365-372, illus. 2).—During June-September, 36 colonies of this ant were dug and counted. Colonies averaged 737 individuals, with a range of 60 to 1,354; the workers averaged 255.2, with a range of 35 to 561. Overwintered larvae gave rise to the ♂♂ and ♀♀ and the first workers of the season. Eggs were laid throughout the summer with peaks of production in June and August; pupae reached peaks at these same times, and larvae and workers increased steadily throughout the summer. Workers foraged for a yard or two about the nests; they had a varied diet and were especially attracted to sweet food. They were noncombative ants, not defending any territory by fighting. They foraged singly, not forming trails; when bits of food were found they almost invariably took them directly home. Nest entrances had little chimneys of dead grass built up above them and were very inconspicuous. The nests consisted of a single central gallery with radiating chambers averaging 8.2; the average depth of the nests was 12.4 in.

Observations on the nesting habits of some digger wasps (Sphecidae; Hymenoptera), R. W. STRANDTMANN (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 305-313, illus. 10).—Notes on the nesting habits—including the prey—of some 11 species of digger wasps.

Studies on cotton jassid, *Empoasca devastans* Distant, in the Punjab.—VII, Age of leaf and jassid susceptibility, A. GHANI, M. AFZAL, and D. N. NANDA (*Indian Acad. Sci. Proc.*, 22 (1945), No. 4, Sect. B, pp. 219-224, illus. 1).—Preliminary studies indicated that this jassid prefers leaves about 35 to 45 days old for oviposition; younger and older leaves are usually left alone. This is important in the breeding of cotton for jassid resistance, since the worker must look for the "jassing effect" in the midzone of the plant rather than at the top or bottom.

***Myiophasia globosa* (Tns.), a tachinid parasite of the cowpea curculio, T. L. BISSELL.** (Ga. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 417-440, illus. 27).—Among a number of parasites of this serious pest of cowpeas in the pod in the Southern States, the tachinid *M. globosa* is said to be the most important. In this contribution, the author reviews the literature of the parasite (27 references), outlines his methods of study, describes the various stages of the parasite, and presents data on its life history (including certain abnormalities) and rate of development. Nine curculionid hosts besides the unique cowpea bruchid are known; these attack 12 different plants. With 10 known curculionid hosts working in a variety of habitats, it is deemed likely that many more curculionid hosts exist. Of the 3 that have been reared in numbers sufficient to give reliable data as to effectiveness—boll weevil, plum curculio, and cowpea curculio—the last is by far the favorite host of the parasite. It is obvious, however, that hosts other than the cowpea curculio are important in providing a supply of parasites, because cowpeas grown at a distance from the preceding year's fields are usually well infested with curculios and these in turn by *M. globosa*; some little-known or undiscovered host may thus be the medium of hibernation rather than the cowpea curculio.

Wireworms and spring oats, D. J. FINNEY and S. G. JARY (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 52 (1946), No. 11, pp. 491-498).—Evidence from a wireworm survey in England and Wales indicated spring oats to be one of the common farm crops most susceptible to attack, though good conditions of culture can substantially reduce the damage. Experiments showed that with normal seeding rates on fields with high populations, the number of plants remaining after attack may be insuff-

ficient to produce a full yield. The chance of a satisfactory crop was increased in such cases by sowing additional seed; 50 percent extra may increase the yield by 3 to 5 cwt. of grain per acre at the higher levels of wireworm population. A similar though less marked effect was apparently produced by cross-drilling without any increase in the total sown, though the evidence here was less clear.

Nitrogen for oats affected by greenbug, C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 11, p. 1).—A practical account.

Aphid resistance in potatoes, J. B. ADAMS (*Amer. Potato Jour.*, 23 (1946), No. 1, pp. 1-22, illus. 5).—Following a brief review of previous studies (24 references) on insect resistance in plants which had a bearing on aphid resistance in the genus *Solanum*, the author describes the procedure and results of experiments carried on during 1939-45 to test aphid reactions critically in about 20 varieties of potatoes and 5 other *Solanums*, and generally in some 90 other varieties. The green peach aphid was used in all tests. Reactions were classified as very susceptible, susceptible, tolerant, resistant, very resistant, and immune. The detailed results are tabulated. The author discusses the finding that potato varieties differ materially in their reactions to the feeding of aphid populations and considers the possibilities of breeding for resistance to them—both for the entomological and the pathological values. A similarity is noted between the results obtained in leafhopper resistance studies and those found in the aphid work.

A study of the metabolism of chlorophyll in the squash bug (*Anasa tristis* DeGeer), R. L. METCALF (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 397-402).—Chlorophyll was found to break down in the gut wall of the squash bug and the related *Acanthocephala terminalia* to give free magnesium. A ruby red material, probably pheophorbides, is present in the salivary glands, testes, and hypodermis. The chlorophyll is still further degraded to a green pigment giving the Gmelin reaction; it is present in the fat body and pericardial cells; this material is believed to be the first reported example of a naturally occurring chlorophyll derivative of the bile-pigment type. In the malpighian tubes is found a non-Gmelin positive yellow pigment which, when acidified, has a strong yellow-green fluorescence; an identical material is formed by oxidation of the green pigment.

Pest control in commercial fruit plantings (*Ill. Agr. Col. Ext. Cir.* 568, rev. (1946), pp. 48, illus. 10).—This informative circular presents information on insect, disease, and rodent control, important supplementary facts relating to insects and diseases, preparation of spray materials, and commercial and promising new spray materials.

[Codling moth control] (*Peninsula Hort. Soc. [Del.] Trans.*, 58 (1944), pp. 17-19, 20-29).—The following brief papers are included: Codling Moth in 1944, by W. L. Allen (pp. 17-19); Codling Moth Control by DDT Sprays, by C. Graham (pp. 20-24) (Univ. Md.); and New Insecticides for Codling Moth Control, by B. A. Porter (pp. 24-29) (U. S. D. A.).

Basic reasons for difficulties in codling moth control, C. R. CUTRIGHT, M. A. VOGEL, and T. H. PARKS (*Ohio Sta. Bimo. Bul.* 237 (1945), pp. 195-199).—The authors divide the basic reasons for difficulties in codling moth control into three groups as follows: A, Weather favorable to the codling moth; B, Codling moth resistance or tolerance to spray materials in common use; and C, Other factors in orchard practice and management that favor the codling moth. Group C includes two main categories, namely, factors not associated with spray and factors associated with spray. Each of the three major groups is discussed in detail.

Black cherry aphid controlled with dormant sprays, F. Z. HARTZELL. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, pp. 7-8, illus. 1).—Black cherry aphid multiplies rapidly and causes serious loss under favorable conditions. Some of the more effective controls, such as tar distillate and dinitro sprays, are discussed.

Coincident infestations of *Aonidiella citrina* and *Coccus hesperidum*, an effect of ant activity, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 26 (1946), No. 1, p. 14).—A note showing ants to be responsible for infestation of orange trees growing along the street at Redlands, Calif., by the yellow scale.

Forest entomology: Sixth annual report for the year ending March the 31st, 1943, L. DAVIAULT ET AL. (*Quebec Dept. Lands and Forests, Contrib.* 21 (1944), pp. 11, illus. 1).—Brief reports are included on a forest insect survey in the Province of Quebec, the inspection service, biological control, and research on wood and bark borers in burnt and cut-over areas.

Notes on the birch shoot borer *Epinotia solicitana* Walker (Olethreutidae: Lepidoptera), C. C. SMITH (*Acadian Nat.*, 2 (1946), No. 6, pp. 114-121, illus. 5).—The author presents an account of the life history and biology of a lepidopterous caterpillar damaging the shoots of white and gray birch in the Maritime region, Gaspé Peninsula, and Newfoundland, including a detailed description of the injury (illustrated by photographs) and some data on the amount of damage caused.

The elm *Calligrapha*, G. A. DEAN (*Kansas Sta. Cir.* 234 (1946), pp. 7, illus. 4).—Notes on biology, life stages, and control of this insect, which during the late spring and summer of 1944 was found partially or completely defoliating American elms at several points in Kansas.

The relation between poison concentration and survival time of roaches injected with sodium metarsenite, J. F. YEAGER and S. C. MUNSON. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 4, pp. 559-600, illus. 5).—Quantitative injections of sodium metarsenite dissolved in saline were made into nymphs of the American and oriental cockroaches, survival times determined, and concentration-survival time curves plotted. The curves were all hyperbolic and exhibited distinct inflections near the region of greatest curvature. At certain lower concentrations there was a critical zone in which the frequency distributions of the insects used to determine a point on the curve tended to spread out and become bimodal. Survival times agreeing well with those obtained experimentally were calculated via equations; their formulation and the reasoning on which they were based are fully explained. These equations are based on the working hypothesis that poisoning occurs through combination of arsenic in ionic form—or via ionic form as an intermediate step—with certain components of the insect tissues. The inflection in the experimental curve can be duplicated in the calculated curve and is considered to be associated with and most probably caused by the rate at which the injected arsenite approaches its maximum dissociation in the insect body fluids. Should this hypothesis be wrong in assuming such importance for the dissociation, whatever factor is substituted for it must behave in the way that dissociation of the poison—as indicated by the equations—is now considered to act. There is reason to believe that the dissociation curve of injected sodium metarsenite after its mixture with the body fluids can be determined approximately by the formula given. It is concluded that the equations express certain phases of the toxic processes involved in arsenical poisoning in the cockroach, and that either ionization of the insecticide within the insect body or a factor that behaves in a similar way plays an important role in the processes of poisoning, greatly influencing the relationship between dosage and survival time. There are 15 references.

DDT rids poultry houses of bedbugs, W. M. KULASH (*Res. and Farming [North Carolina Sta.]*, 4 (1945), *Prog. Rpt.* 1, pp. 7, 10, illus. 2).—A 5 percent kerosene solution of DDT applied with a barrel-type sprayer was used to treat infested poultry houses in North Carolina for control of the common bedbug. Although a few bedbugs were found 1 mo. following treatment, no live adults or nymphs were present 2 mo. after treatment. The DDT spray used proved more efficient than any material tested previously and had no marked influence on the chickens.

DDT found effective in station tests for control of flies on cattle in dairy barns, W. C. COWSERT, J. W. SCALES, and J. W. WARD (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 12, pp. 1-2).—A practical account based on studies in other states and tests in Mississippi in 1945.

DDT—its possibilities and limitations, H. H. SCHWARDT. (Cornell Univ.). (*Jour. Milk Technol.*, 8 (1945), No. 6, pp. 356-359).—A brief summary, with a discussion of experiments in about 75 dairy barns. The results indicated that 3 lb. DDT in 100 gal. water will give excellent protection against houseflies for 2 mo., and that two applications per season will give reasonable freedom from flies from frost to frost in the New York State area under test. "Its intelligent application should eventually free the dairyman of one of his greatest annoyances."

The development of the midgut in the larva of *Aedes dorsalis* Meigen, C. A. RICHINS (*Ann. Ent. Soc. Amer.*, 38 (1945), No. 3, pp. 314-320, illus. 5).

Anopheles nataliae, a new species from Guadalcanal, J. N. BELKIN (*Jour. Parasitol.*, 31 (1945), No. 5, pp. 315-318, illus. 6).

Nota sobre tres Culicidos, nuevos para España [Note on three mosquitoes new to Spain], F. TORRES CAÑAMARES (*Eos [Madrid]*, 20 (1944), No. 1-2, pp. 65-70, illus. 3).—On *Uranotaenia unguiculata* Edw., *Anopheles marteri* Sen. & Prun., and *Aedes refiki* Medjid.

Biology and control of the American dog tick, C. N. SMITH, M. M. COLE, and H. K. GOUCK (*U. S. Dept. Agr., Tech. Bul.* 905 (1946), pp. 74, illus. 37).—This tick is widely distributed east of the Rocky Mountains and occurs also in California. Biological studies were carried out at Martha's Vineyard, Mass. Adult ticks lived under experimental conditions for more than 2 years without feeding. The ticks feed on mammal blood and mate on the host. Males feed and mate intermittently for an indefinite period, but females engorge in about 10 days, drop from the host, and seek a hiding place. Oviposition normally begins 6 to 58 days later, the eggs being deposited in masses of 4,000 to 6,500 over a period of 14 to 32 days. The incubation period may range from 36 to 303 days. Larval ticks which feed on mammal blood and remain attached for 4 days may live for more than a year without food. Fully engorged larvae drop from the host and transform to nymphs in a protected place. The period from dropping to molting ranged from 10 to 247 days. Nymphs had an engorging period ranging from 3 to 11 days, and the period from dropping to molting ranged from 24 to 291 days. Observations were made on nymphs that lived 584 days without feeding. Larval activity began in the field in March or April, reached a peak in March, April, or May, declined as the season progressed but sometimes rose again to a peak in August or September, and ceased in September or October; nymphal activity began in March or April and increased until July or August and then declined until it ceased in September or October, while adult activity began in April, increased until June or July, and then decreased until it ceased in August or September.

Observations on a complete generation from a single infestation in a simulated meadow on a greenhouse table revealed that females that became engorged near the beginning and close of the 1939 season produced an infestation of active larvae from August 31, 1939, to July 28, 1940, an infestation of active nymphs from August 25, 1939, to April 21, 1941, and an infestation of active adults from May 1, 1940, to September 1941.

Although marked ticks persisted in an area throughout most of one season, only 0.24 to 0.57 percent of those marked one year reappeared the next. Ticks apparently moved in all directions with a pronounced tendency to remain at the sides of roads and paths.

Meadow mice were the most important hosts of larvae and nymphs at Martha's Vineyard, and white-footed mice and cottontail rabbits were of secondary importance. Dogs proved to be the most important hosts for adults.

Time required for molting of larvae and nymphs, the preoviposition period, and the incubation period were related to temperature, and nonfavorable temperatures during these periods reduced the longevity of the ticks in the following stages. Relative humidity and precipitation were not correlated with activity or length of developmental period. Photoperiod influences the activity of the immature stages, long and increasing photoperiods being more favorable than short and decreasing ones.

Dips containing 1 oz. of neutral soap and 2 oz. of derris powder (4 percent rotenone) per gal. of water used on dogs every 3 or 4 days proved a satisfactory control. When used for 3 yr., ticks in an area were substantially reduced. Because of the tendency of adult ticks to concentrate on roadsides many ticks may be killed by sprays containing 0.5 percent DDT, 2.5 percent soluble pine oil, and 97 percent water. Poisoning of meadow mice also reduced ticks in the treated area. Burning a portion of an area was followed by a reduction in the number of ticks in the burned portion.

Parasites did not appreciably reduce tick numbers.

Controlling cattle ticks, R. L. SQUIBB (*U. S. Dept. Agr., Agr. in Americas*, 6 (1946), No. 1, pp. 12-14, illus. 3).—The cattle tick, *Boophilus annulatus microplus* (Canestrini), is an important cattle pest in South and Central America. A combined spray made of rotenone and DDT has been found effective by the Institute of Agricultural Sciences at Turrialba, Costa Rica, for control of this tick. For a general eradication campaign it is suggested that each animal be sprayed with 80-150 cc. of the combined solution at least each 14 days. Present estimates indicate that the costs for spraying with rotenone and DDT will be less than the costs of cattle dipping.

Beekeeping for profit and pleasure, A. WEBB (*New York: Macmillan Co.*, 1943, pp. 116+, illus. 64).—A popular compendium of information.

[**Papers on apiculture**], F. C. PELLET (*Iowa State Hort. Soc. [Rpt.]*, 79 (1944), pp. 121-125, 258-291, illus. 9).—The following are included: Need of Bees in Agriculture (pp. 121-125), Progress in Honey Plant Garden (pp. 258-272), and Legumes in the Test Garden (pp. 272-291).

A simple field test for American foulbrood, E. C. HOLST. (U. S. D. A.). (*Gleanings Bee Cult.*, 74 (1946), No. 1, pp. 6-7).—The enzyme causing liquefaction of milk casein was found suited to a simple field test for American foulbrood of honeybees. It is produced by *Bacillus larvae* when the spores are formed and is thus abundant in "ropy" larvae, persisting over the scales for years if kept under ordinary conditions. Details of the procedure are given.

Bee-killing Asilidae of the Southeastern States (Diptera), S. W. BROMLEY (*Ent. Soc. Wash. Proc.*, 48 (1946), No. 1, pp. 16-17).—The receipt of nearly 1,000 asilids with their prey throws an interesting light on the prey of the southern robber flies; taken in conjunction with the data from the author's collecting and the records of various other workers, the result has been a representative cross section of asilid prey habits in this area. A table illustrates the total number of prey records made by the author for the 20 species of "bee-killers" from this region, the number of honeybees represented as prey, and their percentage of the total for each asilid species.

The hope of DDT, E. R. ROOR (*Gleanings Bee Cult.*, 74 (1946), No. 1, pp. 16-17).—"If care is taken to avoid the application of DDT on honey plants in full bloom, there is distinct hope that it may not prove so serious a menace as the arsenicals."

ANIMAL PRODUCTION

Commercial feeding stuffs, September 1, 1944, to August 31, 1945, F. D. BROCK and M. P. HOLLEMAN (*Texas Sta. Bul. 673 (1945), pp. 160*).—The usual report is presented on the guaranteed and found analyses of feeds examined for the year ended August 31, 1945 (E. S. R., 93, p. 65), together with data on the feed violations, carotene content, hardness of cottonseed cake, and carbonate of lime and salt in mixed feeds.

Sheep, L. J. HORLACHER and C. HAMMONDS (*Danville, Ill.: Interstate, 1945, 2. ed., rev., pp. 348, illus. 140*).—A revised edition of the book previously noted (E. S. R., 77, p. 230).

Winter grazing, hay, concentrates for the ewe flock, H. H. LEVECK (*Miss. Farm Res. [Mississippi Sta.], 8 (1945), No. 11, p. 7*).—General directions for use of roughage with concentrates.

Growth of bacon type hogs: Rates of gain at specific live weights, C. D. T. CAMERON, G. C. ASHTON, S. A. HILTON, and E. W. CRAMPTON (*Sci. Agr., 25 (1945), No. 12, pp. 854-859, illus. 4*).—Biweekly weights were recorded on 183 group-fed Yorkshire hogs on rations usually consisting mainly of barley. The average daily gains are given for weights in 10-lb. intervals from 30 to 200 lb. live weight. Evidently the rates of live-weight increases of these creep-fed bacon pigs are influenced by feeding practices. This is brought out by comparison with the rate of gains of pigs reported by Ashton and Crampton (E. S. R., 90, p. 238).

Mixed supplements for hogs, C. M. VESTAL (*Indiana Sta. Bul. 508 (1945), p. 16, illus. 1*).—Complex mixed supplements were more efficient than simple mixtures or single supplements in swine rations in dry lot and on pasture. The most satisfactory results as measured by rate and economy of gain were obtained with a supplement of 20 lb. of meat and bone scrap, 20 lb. of fish meal, 40 lb. of soybean meal, 10 lb. of cottonseed meal, and 10 lb. of alfalfa leaf meal added to a ration of yellow corn fed in dry lot and on pasture. From 1937 to 1942 complex supplements were compared with single feeds or mixtures of two or more. The more complex supplements produced an average daily gain of 1.7, and bone meal as a single supplement produced 1.62 lb. on pasture. The rate of gain was increased and the cost reduced by substituting meat and bone scrap for one-half the fish meal in the supplement. With additions of linseed meal the gain was increased in pigs fed on pasture. Other slight modifications in the supplement fed produced more rapid and cheaper gains. Corn Belt products were largely used, but fish meal and cottonseed meal produced outside the area were important factors in maintaining efficiency. Linseed meal was of minor importance. Dried skim milk did not prove a practical substitute for one-half the fish meal because of a heavier consumption of the supplement with free-choice feeding. Mineralizing one supplement with free-choice feeding reduced the rate of gain and feed consumption. There was a slower rate of gain with ground soybeans than with soybean meal, the average daily gains over 3 yr. being, respectively, 1.62 and 1.70 lb.

Commercial poultry farming, T. B. CHARLES and H. O. STUART (*Danville, Ill.: Interstate, 1946, 5. ed., pp. 544+, about 260 illus.*).—A fifth edition (E. S. R., 89, p. 722).

The effect of selection of chicks upon variability in growth data, J. B. O'NEIL (*Poultry Sci., 25 (1946), No. 1, pp. 69-73*).—In a study of the effect of selection of chicks at 1 and 2 weeks of age on the variability in weight at 8 weeks, 18 groups of 40 chicks each were reduced to 25 by using the median and 12 on either side. The mean weights of the selected and unselected groups at 8 weeks of age showed no significant differences. The coefficient of variability of the selected groups was slightly greater at 8 weeks of age than for unselected groups. Mortality was less

for chicks selected at 2 weeks of age, but the saving was not large enough to have practical significance. Either the mean or median could be used as the basis of selection. ♀♀ had a lower coefficient of variability than ♂♂.

Planning a year-round poultry green feed program for Oklahoma, R. H. THAYER (*Oklahoma Sta. Cir.* 120 (1946), pp. 16+, *illus.* 10).—A schedule of planting green crops to make available green feeds as sources of vitamins, proteins, and minerals for poultry is suggested for each month of the year.

The effect of sudden changes of feed upon production, J. B. O'NEIL (*Poultry Sci.*, 25 (1946), No. 1, pp. 83-85, *illus.* 1).—In this experiment 3 duplicate pens of 50 birds each were included and records kept on production, body weight, size, egg weight, feed consumption, hatchability, and mortality. Sudden changes of feed had a deleterious effect on production. Changes in the color of the mash may be an influencing factor. There was lower mash consumption and egg production with some molting. The time of recovery was usually 8 to 10 weeks.

Growth inhibition of chicks on rations containing corn grits, P. S. SARMA and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 39-40).—Corn grits added to a purified ration to the extent of 40 percent had a deleterious effect on growth at three different protein levels. The inhibitory effect of the corn grits was completely counteracted by the addition of nicotinic acid to the ration. The amounts of nicotinic acid added were 0.8, 1.05, 2.05, 1.3, and 2.3 mg. percent. With more than 1 mg. percent of nicotinic acid, the gains with the corn grits equaled or exceeded those without it.

Effect of tung meal in rations for growing chicks, G. K. DAVIS, N. R. MEHRHOF, and R. S. MCKINNEY. (Fla. Expt. Sta. and U. S. D. A.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 74-79, *illus.* 2).—Eight lots of 25 Single-Comb White Leghorn chicks each received rations containing about 20 percent of protein made up with 0, 5, 10, or 15 percent tung meal and soybean meal. The tung meal was subjected to different heat treatments and sieving. All tung meal rations caused a severe diarrhea in chicks receiving them. The droppings were wet and foul smelling, and the feathers were soiled. Mortality was heavy with the larger amounts of tung meal. The livers were damaged with necrotic areas. Tung meal heated at 11.5 lb. pressure and 115.5° C. was as toxic as raw tung meal. Above 5 percent tung meal, feed utilization was reduced. Heating tung meal at 128° and 22 lb. pressure was not safe for chick feeding.

Observations on an unidentified feather-pigment factor necessary for chickens fed purified diets, G. M. BRIGGS. (Md. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 41-46, *illus.* 2).—In further extension of the findings of McGinnis et al. (E. S. R., 89, p. 245), faulty feather pigmentation was noted as a result of the deficiency of an unidentified factor in New Hampshire and crossbred chicks fed highly purified rations. In addition, inanition may cause moderate feather depigmentation, as shown by paired feeding experiments. "The feather-pigment factor is present in a water-soluble liver fraction (Wilson Liver Fraction L) and is distinct from all chemically identified vitamins available at present, including para-aminobenzoic acid and inositol. The factor may be identical with vitamins B₁₂, B₉, or vitamin B₆ (folic acid)."

The effect of gelatin on the antiperotic properties of choline, betaine, and yeast, H. L. LUCAS, L. C. NORRIS, and G. F. HEUSER. (Cornell Univ.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 93-94).—Two basal mixtures, one with and one without gelatin, were formulated as slight modifications of the diet used by McGinnis et al. (E. S. R., 92, p. 829). Gelatin added to a simplified ration of natural ingredients interfered markedly with the antiperotic properties of betaine and yeast, but it had only a slightly unfavorable effect on the antiperotic properties of choline. Each lot consisted of 20 Rhode Island Red × Barred Plymouth Rock crossbred cockerels. De-

termination was made of the incidence of perosis for each lot at 15 and 30 days of age, with and without gelatin additions.

Studies on the pyridoxin requirements of laying and breeding hens, W. W. CRAVENS, E. E. SEBESTA, J. G. HALPIN, and E. B. HART. (Wis. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 80-82, *illus.* 1).—In further experiments on the pyridoxine requirement of laying and breeding hens (E. S. R., 88, p. 804), using the basal ration of that experiment, the egg production of 0.73 per day during the first 2 weeks decreased to 0.59 and 0.41 during the succeeding 2-week periods and by the end of the sixth week practically ceased. The egg production increased as the pyridoxine supplement increased until it reached 2 mg. per kilogram of ration. The requirement of pyridoxine was 2 mg. per kilogram for laying and breeding hens. A ration deficient in pyridoxine resulted in anorexia and rapid drop in body weight, egg production, and hatchability. Convulsions were not observed.

Value of high levels of calcium pantothenate and pyridoxine hydrochloride in chick diets free of animal protein, H. R. BIRD and M. RUBIN. (U. S. D. A.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 87-89).—In three experiments groups of 25 chicks each were fed various combinations of crystalline choline chloride, nicotinic acid hydrochloride, calcium pantothenate, and pyridoxine hydrochloride, with live weights ascertained at 6 weeks. Rhode Island Red chicks were used in the first two experiments, with crossbred chicks in the third. Either calcium pantothenate or pyridoxine hydrochloride at unusually high levels is capable of exerting an important effect upon the growth of chicks fed a ration of high choline content. These results are thought to explain satisfactorily disagreements in the effects of choline supplements (E. S. R., 92, p. 825).

Abnormal blackening of the feathers of New Hampshire chicks as the result of vitamin D deficiency, E. W. GLAZENER, J. P. MATTINGLY, and G. M. BRIGGS. (Md. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 85-86).—In three lots of New Hampshire chicks, abnormal blackening of the base of the secondaries, primaries, and other feathers resulted from feeding a ration deficient in vitamin D. The blackening was prevented by supplementing the ration with vitamin D.

The artificial control of egg production, G. O. HALL. ([N. Y.] Cornell Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 3-12, *illus.* 2).—The artificial control of the distribution of egg production by restricted feeding (pen A) and restricted feeding combined with restricted lighting (pen B) was compared for 2 yr. in 3 groups of 30 Single-Comb White Leghorn hens each in their second year's production. Observations were recorded on molt, weight changes, egg production, fertility, hatchability, feed consumption, and mortality for periods from June 1 to January 31. In both pens A and B there was a marked decline in body weight, which amounted to above 27 percent and was fully regained with adequate feed. In pen B the molt was both rapid and complete, but it was slow and erratic in pen A. There was little or no molting until relatively late in the fall in the control lot (pen C). Molt was a good index of reproductive condition at all times. Mortality was highest in pen A and lowest in pen B. Egg production was significantly lower in pen A than in the other groups. Artificial control of egg production was not economically sound if based on the market value of the shell eggs in the 2 yr. Total feed consumption was about 7 percent less than in controls. The percentage hatchability was significantly higher in the treated pens for fertile and total eggs than for controls. The number of chicks from pen A was double the number from pen C. A further increase was produced by pen B. The artificial control of egg production during the summer months is possible, and such control may greatly increase the number of fall chicks, which should definitely increase the economical returns.

The effect of vitamins D₂ and D₃ in fish oils and of iodocasein on shell quality, H. S. GUTTERIDGE and J. M. PRATT (*Poultry Sci.*, 25 (1946), No. 1, pp. 89-91).—In a study of factors influencing the quality of the shell of eggs as measured by the specific gravity of shell strength by the methods of Olsson (E. S. R., 73, p. 91), 4 lots of 30 Single-Comb White Leghorn pullets each were fed in the following manner: Group 1, basal ration + 135 gm. 400 D₂, 1850 A oil per hundredweight of ration (control); group 2, basal ration + 128 gm. 400 D₂, 1850 A oil + 135 gm. 400 D₂, 1850 A oil per hundredweight of ration; group 3, basal ration + 575 gm. 85 D, 2000 A oil per hundredweight of ration; group 4, same as group 1 + 15 gm. iodocasein per hundredweight of ration. There were differences in the amount of vitamin A in the different lots, but no attempt was made to balance them. From June 13 to August 28 the thyroprotein exercised a marked beneficial effect on egg-shell strength, presumably by the increased metabolism counteracting the normal decline with increased temperature or other factors. The possibility that different sources of vitamin D actually benefited shell strength requires further investigation.

Effect of dietary level of soybean meal on hatchability, D. WHITSON, H. W. TITUS, and H. R. BIRD. (U. S. D. A.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 52-58, illus. 2).—In 16 lots of 22 Rhode Island Red pullets each, different amounts of soybean meal from 0 to 40 percent were fed for 40 weeks to study the effects on hatchability in rations consisting largely of corn and soybean meal with small quantities of alfalfa leaf meal and other vitamin and mineral supplements. As the amount of soybean meal increased, in increments of 10 percent, the hatchability decreased in spite of apparently adequate quantities of the dietary factors known to affect it. There were statistically significant differences between the hatchability of eggs produced by hens receiving 20, 30, and 40 percent and those receiving no soybean meal. The higher levels of soybean meal had no adverse effects on egg production, body weight, or egg size. In rations with 67 percent grain and 20 percent soybean meal, wheat permitted significantly higher hatchability than corn. A general tendency toward decreased hatchability during the winter months was noted.

The comparative requirements of chicks and turkey poults for riboflavin, F. H. BIRD, V. S. ASMUNDSON, F. H. KRATZER, and S. LEFKOVSKY. (Univ. Calif.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 47-51).—Chick requirements of riboflavin for optimum growth to 4 weeks were 275-325 µg. per 100 gm. of ration, while turkey poults required 325-375 µg. of riboflavin per 100 gm. of ration. There was also less riboflavin required by the chick to prevent curled-toe paralysis than was required for optimum growth. Biotin deficiency caused dermatitis and mortality in the turkey poult. Suboptimum levels of riboflavin caused perosis in the poults, but higher levels of riboflavin prevented it. Lots of 10 chicks and 10 poults were supplied with 0, 50, 100, 150, 200, 250, 300, and 350 µg. of riboflavin per 100 gm. of ration for a 3-week period in each of three tests.

The influence of gelatin on prevention of perosis in turkeys fed choline and betaine, J. MCGINNIS. (Wash. Expt. Sta.). (*Poultry Sci.*, 25 (1946), No. 1, pp. 91-92).—In two experiments betaine was used on groups of 15 day-old Broad Breasted Bronze turkey poults. The feeding test lasted 4 weeks. The basal ration of one experiment contained 57 gm. of ground yellow corn, 15 gm. peanut meal, 10 gm. commercial casein, 10 gm. dried brewers' yeast, 2.5 gm. soybean oil, and 0.5 gm. of fortified fish oil. Supplements of choline, betaine, and choline plus betaine were added to three further lots. In the second experiment the basal ration contained 95 gm. of basal ration plus 5 gm. of gelatin.

The results of the two experiments showed that both choline and betaine were effective in reducing the incidence of perosis, but that neither prevented perosis completely. Choline was slightly more effective than betaine in preventing perosis. Betaine was ineffective in promoting growth, and choline had only a slight effect. The

addition of gelatin increased the incidence of perosis, depressed growth, and reduced the perosis-preventing properties of betaine. These results indicated that gelatin contains a factor which interferes with biological choline synthesis. It appeared that the methyl groups of betaine might be consumed in this process instead of being used in the synthesis of choline for prevention of perosis. From a consideration of other results, it seems that a precursor may be required for the biological synthesis of choline from betaine by the turkey and that gelatin contains a factor which inhibits choline synthesis.

Effect of withholding feed and water on early poult mortality and growth, W. T. CHILSON and H. PATRICK (*Poultry Sci.*, 25 (1946), No. 1, pp. 86-87).—In studies with 3 lots of more than 100 poults each, gains were greater and mortality was reduced in lots receiving feed and water 24 hr. after hatching than in other lots from which feed and water were withheld for 48 and 72 hr.

Relation of broodiness to reproduction in turkey hens, J. E. PARKER and O. A. BARTON (*North Dakota Sta. Bimo. Bul.*, 8 (1945), No. 2, pp. 3-5).—Of 59 Broad Breasted Bronze turkey hens in the first year of production, 15 hens showed no broodiness to June 1, 16 were broody once, 18 twice, 9 three times, and 1 hen had four broody periods. The number of eggs per group was negatively correlated with the number of broody periods. Percentages of fertility and hatchability of eggs set were higher in broody groups than in nonbroody groups.

Goiter in domestic pigeons, W. F. HOLLANDER and O. RIDDLE (*Poultry Sci.*, 25 (1946), No. 1, pp. 20-27, illus. 4).—Description is given of many goiter cases in pigeons reared on Long Island, N. Y., and at Sumter, S. C. Some races were more resistant than others to the development of goiter in the same environments. The most serious condition associated with goiter is debility of the young at hatching. Supplements of potassium iodide cured and prevented goiter in adults and also prevented goiter and most cases of weakness at or near hatching. An extensive list of references is included.

DAIRY FARMING—DAIRYING

The carbon dioxide content of the blood of dairy cattle, J. DENNIS and F. G. HARBAUGH (*Amer. Jour. Vet. Res.*, 7 (1946), No. 22, pp. 37-40, illus. 2).—Determinations of the average blood-carbon dioxide content showed 53.6 volumes percent for Jerseys and 56.5 for Holsteins. In the Jerseys the content varied inversely with the temperature, but this variation in Holsteins was less pronounced.

It was found that "the carbon dioxide content of the blood from the jugular vein does not differ significantly from that from the subcutaneous abdominal vein. There appears to be no general relationship between the carbon dioxide content of the blood of an animal and its position in the estrus cycle. In two experiments, cows with brucellosis had a higher average carbon dioxide content than noninfected cows; however, this has not been true in all experiments."

The effect of increasing the negative pressure and widening of the vacuum-release ratio on the rate of removal of milk from the udder, V. R. SMITH and W. E. PETERSEN. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 1, pp. 45-53, illus. 1).—Observations were made on 12 cows to show the effects of increasing the negative pressure and widening the pulsation ratios on the rate of milk flow and completeness of milking. Each of the four quarters was tested at the height of milking at 10, 12.5, and 15 in. Hg negative pressure. The rates of milk withdrawal were established per 10 sec. for 1 : 1 and 3 : 1 pulsation ratios at 10, 12, and 14 in. Hg negative pressure and for the 1 : 1 and 2 : 1 pulsation ratios at 10, 12, 14, and 16 in. Hg negative pressure levels. The rate of milk withdrawal was increased with increases in the negative pressure from 10 to 16 in. of Hg, but not at uniform

rates for all cows. The rate of milk withdrawal was increased by widening the pulsation ratio. In general there was lesser increase in the rate of milk withdrawal by the wider pulsation ratios as the negative pressure increased. Effects of negative pressure and widening the pulsation ratios on completeness of milking were variable. The completeness of milking was related to the shape of the udder.

Some physiological effects of extending the colostrum feeding period of dairy calves, T. S. SUTTON and H. E. KAESER. (Ohio Expt. Sta. and Univ.). (*Jour. Dairy Sci.*, 29 (1946), No. 1, pp. 13-26).—In studies with 36 dairy calves it was found that calves are born with low vitamin A reserves, but the level of ascorbic acid in the blood plasma is considerably above that of later life. With ingestion of colostrum, vitamin A in the plasma increased rapidly. The average increase was 12.4 μ g. per 100 cc. of plasma in the first 3 days, resulting from an average intake of 99,614 International Units of vitamin A from the colostrum. When colostrum feeding was continued, the amount of vitamin A in the plasma reached a peak of 18.9 μ g. of vitamin A per 100 cc. of plasma on the seventh day, which was 7.8 μ g. above the plasma of 7-day-old calves that received no colostrum for 3 days. With colostrum feeding for 7 days, the blood plasma vitamin A averaged almost identically the same at 21 days of age as for calves which received colostrum for 3 days plus 10,000 I. U. of vitamin A daily for 21 days. Colostrum feeding for 7 days did not influence the level of ascorbic acid in the plasma or the occurrence of digestive disturbances. The additional colostrum feeding was economical and produced more rapid gains.

Influence of homogenization of fat on haircoat of dairy calves, W. BATE, D. ESPE, and C. Y. CANNON. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 29 (1946), No. 1, pp. 41-43, illus. 1).—The use of filled milk (skim milk and an unnatural fat) for calves in one group caused the hair to fall out. In a second group, when homogenized soybean oil was added as the unnatural fat to skim milk this hair condition was not noted. The rations were alternated for different periods, in which the un-homogenized fat ration caused the hair to fall out and the homogenized ration prevented the condition. Hair falling was not noted when roughage or grain was fed, but with these unnatural fat rations the calves grew at a rate below normal.

A spectrophotometric study of the changes in peroxide value of spray-dried whole milk powder during storage, H. PYENSON and P. H. TRACY. (Univ. Ill.). (*Jour. Dairy Sci.*, 29 (1946), No. 1, pp. 1-12, illus. 4).—Determinations were made periodically of oxygen on carbon dioxide present in the head space gas of 100-gm. samples of powdered whole milk stored up to 1 yr. at 35° and 100° F., with one-half of the samples stored in air and one-half nitrogen-packed. The amount of carbon dioxide involved during storage was not uniform, suggesting that this gas was resorbed by certain constituents of the milk. The carbon dioxide values were higher in samples stored at 100° than at 35°. In air-packed samples there was about 2.7 times as much oxygen absorbed at 100° as at 35°, and 3.3 times as much oxygen absorbed at the higher temperature in nitrogen-packed samples. There was some peroxide value in most of the freshly packed samples, but they did not develop an oxidized flavor until after 9 mo. of storage. Maximum peroxide values were reached in 6 to 9 mo., followed by a downward trend thereafter. Peroxide values showed no correlation with the temperature of storage or the method of packing. Flavor decreased during storage, but at a more rapid rate in air-packed samples and in those held at 100°. The peroxide formation was higher after 12 mo. of storage, but not sufficiently correlated with flavor to justify its use as a means of measuring or predicting keeping quality of whole milk powder. Organoleptic tests remain the most accurate method of measuring flavor and odor changes.

The keeping quality of samples of commercially dried milk packed in air and in inert gas, G. B. GREENBANK, P. A. WRIGHT, E. F. DEYSHER, and G. E. HOLM.

(U. S. D. A.). (*Jour. Dairy Sci.*, 29 (1946), No 1, pp. 55-61, illus. 4).—Approximately 1,500 samples of dried milk, half of which had been packed in inert gas and half in air were stored at different temperatures—20°, 30°, 37°, 45°, and 55° C. At regular time intervals containers were removed for study of the flavors, odors, and peroxide value ascertained after reconstituting. There was no indication of any considerable decomposition of the peroxide formed at 20°, 30°, and 37°, but at temperatures of 45° and 55° the rates of auto-oxidation indicated a progressive increase in the rate of decomposition of peroxides as storage temperatures increased. There was great variation in the keeping quality of the six commercially prepared dry milks. Those packed in air could not be relied on consistently to withstand severe conditions of storage for 6 mo. to 1 yr. without developing oxidized flavors and odors. Those packed in inert gases with an oxygen content of 3 to 4 percent had a better keeping quality. The rate of peroxide development in samples packed in air stored at temperatures up to 45° can be relied on as a fairly accurate measure of the rate of auto-oxidation and as a measure of the relative keeping quality of dried milk. Slight off-flavors and odors could usually be detected when the peroxide value reached approximately 0.50. The keeping quality test may be accelerated by the use of 37° and 45°, but 55° was unsatisfactory because of the destruction of peroxides and the development of discoloration and off-flavors not connected with fat oxidation. The peroxide test may be used for dried milk packed in air, but organoleptic tests are best for dried milk packed in inert gas.

The retention of nutrients in cheese making, I-III, O. R. IRVINE, L. R. BRYANT, W. H. SPROULE, S. H. JACKSON, A. CROOK, and W. M. JOHNSTONE (*Sci. Agr.*, 25 (1945), No. 12, pp. 817-853, illus. 6).—Three papers are presented:

I. *The retention of calcium, phosphorus, and riboflavin in Cheddar cheese made from raw milk* (pp. 817-832).—About 61 percent of the Ca, 53 percent of the P, and 23 percent of the riboflavin originally present in raw milk were present in Cheddar cheese made from it. The small variations in the amount were not correlated with the season. Riboflavin seemed to be stable throughout a ripening period of 12 mo. at temperatures of 40° and 58° F. The apparent diminution during the first 2 mo. was followed by an equal increase during the final months of the ripening period. Differences in soil type did not appear to be important factors affecting the mineral retention in the cheese. The Ca, P, and riboflavin contents of cheese having defective flavors appear to be essentially like those of first-grade cheese.

II. *The effect of pasteurization of the milk upon the retention of calcium, phosphorus, and riboflavin in Cheddar cheese* (pp. 833-844).—Heat treatment of milk by the holder and high-temperature pasteurization methods in comparison with raw milk for cheese making had no effect on the Ca retention, but slightly more of the P was retained in cheese from pasteurized milk than from raw milk. There was no effect on the riboflavin content after 6 months' ripening, though it decreased at first and then increased.

III. *The calcium, phosphorus, and riboflavin contents of cream, cottage, brick, and blue cheese* (pp. 845-853).—The Ca, P, and riboflavin content of these types of cheese and the analysis of the milk showed these nutrients present. Cream cheese contained 84.4 mg. percent Ca, 86 mg. percent P, and 280 µg. per 100 gm. of riboflavin. Cottage cheese contained 85 mg. percent Ca, 146 mg. percent P, and 288 µg. per 100 gm. of riboflavin. In brick cheese there was 57.7 percent of the Ca, 58.7 percent of the P, and 27.4 percent of the riboflavin present in the original milk. The corresponding values for blue cheese were Ca 46.2, P 43.3, and riboflavin 30.1 percent.

Cheddar cheese from pasteurized milk, W. V. PRICE (*Wisconsin Sta. Bul.* 464, rev. (1945), pp. 15+, illus. 23).—A revision (E. S. R., 92, p. 696).

A grating type of cheese popular in America, C. D. DAHLE and G. H. WATEROUS, JR. (Pa. Expt. Sta.). (*Canad. Dairy and Ice Cream Jour.*, 24 (1945), No. 11, pp. 100, 102).—Directions are given for the manufacture of this type of cheese.

VETERINARY MEDICINE

The influence of protein diets on selenium poisoning, I, II, I. ROSENFELD and O. A. BEATH. (Wyo. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 22, pp. 52-61).—The feeding of high, medium, and low protein diets to sheep indicated that the high and medium protein diets afforded more protection against selenium poisoning than the low protein diet. There was no essential difference in protective action between the high and medium protein diets when protection was based upon the duration of life. "The intake of 10 mg. of selenium daily did not produce intoxication in the animals. However, it reduced the food intake in all groups. This suggests that a seleniferous area which supplies 10 mg. of selenium daily in the food of the animals would lower the nutritional state of the animals unless the food is of high quality and thus makes up for the lowered food intake. The intoxicating dose in the low protein group was 15 mg. of selenium given for 6 days, while in the higher protein groups 20 mg. of selenium was administered for 25 days before producing toxic symptoms. The fatal dose in the high and medium protein-diet groups was 30 mg. of selenium for 30 days, and in the low protein-diet group 20 mg. for 13 days. Recovery from acute intoxication was slower in the low protein and medium protein groups than in the high protein group, judging from the food intake. Selenium content of the blood in the low protein-diet group reached a higher level with a lower selenium intake than in the groups which received high and medium protein diets. Symptoms of intoxication occurred in all groups when the blood contained between 1.2 to 1.5 p. p. m. selenium and selenium feeding was continued. Death occurred in all groups after the concentration of selenium in the blood was increased above 2 p. p. m. of selenium and selenium feeding was continued. Higher protein groups maintained a high blood level of selenium for a longer time than did the low protein group, before death occurred. With the cessation of selenium feeding the blood selenium showed an increase first, then a gradual drop to less than 1.0 p. p. m. of selenium".

In part 2, *The Chemical Changes in the Tissues Following Selenium Administration*, it is stated that there was a gradual decrease in the vitamin A and total protein content of the blood and a more rapid decrease in ascorbic acid, suggesting that vitamins and protein deficiencies play an important part in selenium poisoning. An increase of nonprotein nitrogen in the blood was observed in all animals which died from selenium poisoning. The chemical composition of the livers indicated that selenium poisoning in the sheep produced protein and sulfur depletion in these organs. "The increased resistance against selenium poisoning in animals fed high protein diets may be due to the more complete saturation of the liver cells and to the protective action of the protein against the injury of the cell by the toxic action of selenium."

A decrease of vitamin A and ascorbic acid was observed in the livers of animals which died of selenium poisoning. The depletion of nitrogen was not restricted to the liver but occurred also in the heart in some groups. The kidneys, lungs, and spleens showed no changes as to the nitrogen, total protein, and sulfur content. Changes in the chemical composition of the blood, before and after selenium feeding was discontinued, indicated that the decrease of the blood constituents was temporary in nature, and there was a gradual rise toward the normal level after selenium feeding was discontinued. Chemical composition of the tissues 61 to 64 days after discontinuation of selenium feeding showed a 10-percent decrease in the nitrogen content of the liver, but all other organs were normal. This decrease indicated

that protein depletion in the liver was a gradual process, and during selenium feeding there was a continued loss of the protein from the liver.

Check list of the internal and external animal parasites of domestic animals in North America (United States and possessions, and Canada), G. DIKMANS. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 21, pp. 211-241).—This list, subdivided by hosts, presents data on group and common names, scientific names, location in host, intermediate host, and geographical distribution. A bibliography of 72 titles is appended.

Studies on animal dermatomycoses.—I, Clinical studies. II, Cultural studies, A. B. HOERLEIN. (Cornell Univ.). (*Cornell Vet.*, 35 (1945), No. 4, pp. 287-307, illus. 26).—Part 1 of this study (pp. 287-298) deals with clinical studies of diagnostic methods, and dermatomycosis in dogs and cats, cattle, and horses, in which all artificially produced cases recovered spontaneously without treatment. Part 2 (pp. 299-307) deals with cultural studies with *Microsporum canis*, isolated from all cases of dermatomycosis seen in cats and dogs; *Trichophyton album*, found in all bovine cases; *M. equinum*, isolated from one of the positive specimens from horses; and *T. equinum*, the causative agent isolated from one horse.

The mucoid phases of the genus Brucella, I. F. HUDDLESON. (Mich. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 22, pp. 5-10, illus. 1).—In this study it was found that the species of *Brucella* dissociate into several distinctly different mucoid or waxlike phases. Three mucoid phases have been obtained from *B. abortus*, two from *B. suis*, and one from *B. melitensis*. One mucoid phase of *B. abortus* and those of *B. suis* give rise to daughter colonies which are similar in many respects to S (smooth) phase colonies. "M (mucoid) and Md (mucoid daughter) phase cells, when injected into guinea pigs, rabbits, or cattle, give rise, in their blood serum, to specific growth-inhibiting antibodies in high titer and engender in guinea pigs a high degree of active immunity against experimental infection with the species of *Brucella*."

Chemotherapy of Trichomonas foetus (Protozoa) in vitro, B. B. MORGAN and H. M. CAMPBELL. (Wis. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 22, pp. 45-51).—Data are reported, largely in tabular form, as to the in vitro effects of 350 compounds on *T. foetus*.

Streptomycin in experimental tuberculosis, G. P. YOUNG and J. C. MCCARTER (*Amer. Rev. Tuberc.*, 52 (1945), No. 5, pp. 432-439, illus. 4; *Span. abs.*, p. 439).—Streptomycin hydrochloride administered subcutaneously had a marked suppressive effect on experimental pulmonary tuberculosis in mice. The use of mice for testing the effect of chemotherapeutic agents on experimental tuberculosis is discussed.

Clinical diagnosis of tuberculosis, S. G. STEWART (*Vet. Rec.*, 58 (1946), No. 3, pp. 23-26).—This is a discussion of the various types of the disease in the domestic animals, and the characteristic symptoms and differential diagnosis.

Effect of temperature, phenol, and crystal violet on vesicular stomatitis virus, M. S. SHAHAN. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 22, pp. 27-31).—Vesicular stomatitis (V. S.) virus derived from an outbreak of the disease in swine was repeatedly rendered noninfective for guinea pigs by heating in porcine, equine, or bovine serum at 55°, 58°, or 60° C. for 30 min., although in one of six tests at 55° virus of sufficient virulence to infect one to three guinea pigs survived. All other preparations at 55°, 58°, and 60° were noninfective.

These and other tests which are reported "indicate that properly controlled heating of antisera at 58° to 59° for 30 min., as has been required of licensed biological firms by the Bureau [of Animal Industry], will render these products free from infective V. S. virus. It is also evident that the virus will not survive the incubation in the presence of crystal violet that is now prescribed for preparing H. C. [hog cholera] vaccine (crystal-violet formula). Finally, phenol was found

to have only a slowly virucidal action on V. S. virus added to defibrinated H. C. blood held in the refrigerator."

Vesicular stomatitis in cattle and horses in Colorado, E. HEINY. (U. S. D. A.). (*North Amer. Vet.*, 26 (1945), No. 12, pp. 726-730).—Outbreaks in Colorado at various times and places are reviewed. Both the Indiana and New Jersey types have been demonstrated. Because of the extreme similarity of the clinical manifestations and lesions produced by vesicular stomatitis and foot-and-mouth disease, it is emphasized that a clinical diagnosis should not be relied upon and that a correct diagnosis should be made as speedily as possible.

Salmonella types isolated from snakes, W. R. HINSHAW and E. McNEIL. (Univ. Calif.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 21, pp. 264-266).—Continuing earlier studies (E. S. R., 92, p. 272), a total of 11 of 41 snakes caught on ranches in seven localities yielded *Salmonella*. Five types have been isolated: *S. meleagridis*, *S. typhimurium*, *S. newport*, *S. rubislaw*, and *S. panama*.

Salmonella from Galapagos turtles, a gila monster, and an iguana, E. McNEIL and W. R. HINSHAW. (Univ. Calif.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 22, pp. 62-63).—Isolations of *S. sandiego* and *S. newport* from Galapagos turtles, *S. montevideo* from a gila monster, and *S. manhattan* from an iguana are reported. It is believed that this is the first report on the isolation of true *Salmonella* from the Chelonia and Squamata.

Early observations on antibiotic substances in *Penicillium glaucum* and other organisms against a virus, J. S. JOFFE. (N. J. Expt. Stas.). (*Science*, 102 (1945), No. 2659, p. 623).—A translated quotation is given from a paper in Russian on exudative typhus or fowl plague, in which the author² reported his observation that "under the influence of *P. glaucum* the contagion of exudative typhus was destroyed if the blood was diluted in a physiologic solution of NaCl."

Differential bactericidal activity of bovine serum toward strains of *Brucella abortus* of high and low virulence, M. R. IRWIN and B. A. BEACH. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 72 (1946), No. 2, pp. 83-91).—In tests with 15 cows, the bactericidal action of the serum from both normal and vaccinated cattle was shown to depend on the combined activity of antibody and complement. The serum of normal animals usually has an appreciable bactericidal activity at dilutions of 1 : 40 or 1 : 80, that of some individuals at 1 : 160, rarely higher. The serum of animals vaccinated as adults, or nearly so, showed a definite antibacterial activity to *B. abortus* at dilutions of 1 : 1,280 and even at 1 : 10,240 in some individuals. The serum of these individuals showed partial agglutinating reactions no higher than 1 : 100, but with that from one cow at 1 : 200. In the majority of the tests, undiluted or diluted serum destroyed more organisms of strain 19 than of the more virulent strain. These tests show that even in the almost complete absence of agglutinating antibodies the serum of a vaccinated animal may exert antibacterial activity against *B. abortus* greater than that of the serum of normal animals. These results substantiate a previous report (E. S. R., 79, p. 538) on a parallel finding in the serum of animals once infected but with a titer of agglutinating antibodies no higher than in normal cattle.

Bovine mastitis, R. P. LINK (*Kansas Sta. Cir.* 233 (1946), pp. 12, illus. 5).—This is a practical discussion of the disease and its treatment.

Reservoirs of infection of *Streptococcus agalactiae*, G. R. SPENCER, J. McCARTER, and B. A. BEACH (*Amer. Jour. Vet. Res.*, 7 (1946), No. 22, pp. 32-36, illus. 2).—In this attempt to locate the habitat and means of spread of *S. agalactiae* as the predominant cause of chronic bovine mastitis in Wisconsin, this organism could not be found on the floor or in the bedding from beneath infected cows. It

² Tartakovskago (Tartakovskii), M. G. *Arkiv Vet. Nauk*, 34 (1904), pp. 545-575, 617-666.

was found as a part of the resident flora of two milkers' hands in a hand-milked herd, but could not be found on the hands of eight dairy attendants in machine-milked herds. It was found to die rapidly in barn bedding; most of the organisms were dead after 24 hr., but a few lived as long as 6 to 9 days.

In view of the probability that spread within the herd may occur by transfer on the hands of hand milkers, thorough scrubbing is recommended before milking begins, with rinsing in a mild solution of chlorine between cows, and milking discarded secretions from infected quarters into a separate pail and not on the floor.

The routine resazurin test, S. B. THOMAS ET AL. (*Welsh Jour. Agr.*, 18 (1945), pp. 81-93).—Comparison was made of resazurin readings in three sources of illumination, namely, daylight from a north window; the Osram lamp adaptation of the Lovibond comparator with the C. I. E. (Commission Internationale de l'Eclairage 1931) illuminant filter; and a 5-ft. tubular 80-w. fluorescent lamp. Compared with 1,088 readings made in daylight, 93.5 percent read in C. I. E. illumination were within half a disk reading; 5.7 percent were minus 1 to 2 disk readings; and 0.7 percent plus 1 to 2 disk readings. The ease of reading was about equal in fluorescent light and north daylight. No direct sunlight should reach the bench or water bath where tests are being conducted.

The treatment of acute infectious bovine mastitis with penicillin, C. S. BRYAN, J. W. CUNKELMAN, F. W. YOUNG, and E. E. VISGER. (Mich. Expt. Sta.). (*Vet. Med.*, 41 (1946), No. 3, pp. 94-98, illus. 1).—In tests carried on in farmer-owned herds, penicillin treatment was given to 10 cases of acute local streptococcal mastitis, 10 cases of acute local mastitis of staphylococcal origin, and 13 cases of acute systemic mastitis, and 7 cows with acute systemic mastitis were treated with two penicillin treatments and sulfanilamide by mouth.

It is concluded that "penicillin is an effective treatment for acute local and acute systemic mastitis caused by streptococci or staphylococci. Clinical recovery is usually not accompanied by bacteriological recovery when streptococci are involved but usually does occur where staphylococci are involved. Repeated udder infusions were required to yield clinical recovery in acute local mastitis. Two hundred thousand units of penicillin given intravenously and 100,000 units into the involved quarter or quarters, repeated at 12- or 24-hr. intervals, usually resulted in prompt clinical improvement and was followed by clinical recovery in acute systemic mastitis.

"To obtain bacteriological recovery, the infections remaining were treated during the chronic stage of the disease. Two injections of 200,000 units of penicillin administered intravenously and 100,000 units into the involved quarter or quarters at 12-hr. intervals, followed on successive days by 1, $\frac{3}{4}$, and $\frac{3}{4}$ gr. of sulfanilamide per pound, effected clinical recovery almost as rapidly as where the penicillin treatments were repeated many times. Two cases of streptococcal mastitis resistant to repeated penicillin injections were treated successfully by the infusion of 150 cc. or 300 cc. of tyrothricin into the involved quarter."

An earlier report has been noted (E. S. R., 93, p. 73).

Some aspects of the pathogenesis of bovine tuberculosis, based on abattoir returns, J. T. STAMP and A. WILSON (*Vet. Rec.*, 58 (1946), No. 2, pp. 11-15, illus. 1).—Following a review of the theories regarding the portals of entry, abattoir returns from Edinburgh and Birmingham for 189 tuberculous calves, 3,000 tuberculous heifers, 3,000 tuberculous steers, 1,000 tuberculous bulls, and 3,000 tuberculous cows are analyzed and discussed. From these data it is concluded that "in calves the incidence of the disease is very low, infection arising chiefly in two ways, congenitally or by inhalation after birth. Hematogenous dissemination is frequently encountered in the calf following primary infection. The incidence figures for heifers, bullocks, bulls, and cows show, with certainty, that tuberculosis of the adult is not merely a slow progression of lesions acquired in calfhood. It is obvious

that the incidence increases quickly after the animal has attained maturity, so that while in heifers and bullocks the incidence is 6 percent, in bulls it is 27 percent, and in cows 43 percent.

"In these cases the primary complex is predominatingly pulmonary in position. Postprimary hematogenous dissemination giving rise to carcass lymph gland lesions also occurs in these older animals, although not so frequently as in the calf. The common method of dissemination of tuberculosis in these older animals is by the bronchial passages, while further dissemination from the lungs occurs by coughing up and swallowing of tuberculous debris, giving rise to caseous lymphadenitis of the mesenteric lymph glands. In addition to these primary lung infections there are also in the adult bovine a considerable number of cases where lymph gland changes are only seen in the retropharyngeal lymph glands. These glands drain both respiratory and alimentary areas so that it is uncertain by which of these routes infection enters, although the fact that retropharyngeal gland lesions are much more frequently associated with lung and lung gland lesions than with mesenteric gland lesions might indicate that the majority of these lesions are due to inhalation infection.

"Tuberculosis of the liver and/or hepatic lymph glands are also frequently occurring lesions, but the route of infection is complex: (1) Directly from the umbilical vein in congenital tuberculosis; (2) from primary intestinal tuberculosis; (3) from early or late postprimary hematogenous dissemination; (4) from secondary infection of the bowel from swallowed tuberculous sputum. This variety of routes of involvement of the liver and hepatic glands makes these lesions unreliable for the evaluation of the pathogenesis of bovine tuberculosis."

The etiology of calf diphtheria, J. F. RYFF and A. M. LEE. (Wyo. Expt. Sta.). (Amer. Jour. Vet. Res., 7 (1946), No. 22, pp. 41-44).—In addition to *Actinomyces necrophorus*, enterococci, pyogenic streptococci, staphylococci, micrococci, and corynebacteria, together with saprophytic bacteria, were recovered from three naturally occurring cases of calf diphtheria. Injecting intradermally a strain of *A. necrophorus* incapable of producing lesions into the buccal surface of rabbits' lips in conjunction with cultures of secondary invaders resulted in abscess formation or surface necrosis. By increasing the amount injected, and after animal passage, the strain of *A. necrophorus* was capable of initiating such lesions alone. All strains of *Staphylococcus aureus* and one strain of *S. albus*, of a corynebacterium, and of a yeastlike organism were also capable of producing a lesion without the assistance of *A. necrophorus*. Lesions followed in about half of the inoculations where an *A. necrophorus*-saprophytic culture combination was employed and in most cases where *A. necrophorus* was used with a potential pathogen. Marked vitamin deficiency increased the severity of the lesions observed, but conversely, feeding cod-liver oil or ascorbic acid did not decrease the severity under that for control groups.

A venereal disease of sheep, R. S. ROBERTS and J. F. BOLTON (Vet. Rec., 57 (1945), No. 52, pp. 686-687).—An outbreak of a disease characterized by a deep-seated ulceration on the glans penis, is described. Although 10 out of 12 rams became infected early in the breeding season, the crop of lambs obtained was not greatly below expectation. The progress of the disease in the flock was suggestive of contagion within the flock, but there had been no apparent opportunity for the introduction of infection.

The effect of low outdoor temperatures on the free-living stages of some common nematode parasites of sheep, A. G. DINABURG. (U. S. D. A.). (Amer. Jour. Vet. Res., 6 (1945), No. 21, pp. 257-263).—Eggs of *Cooperia curticei*, *Oesophagostomum columbianum*, and *Ostertagia circumcincta* were exposed outdoors for intervals of about 14 days during December 1941 to April 1942 and October 1942 to April 1943, at Beltsville, Md. Those of *Trichostrongylus* spp. were exposed in the second period only.

The temperatures lethal to the preinfective stages of *Oesophagostomum*, *Cooperia*, and *Trichostrongylus* were mean air maxima for 14 days below 42° F. and minima below 29°. Some eggs of *Ostertagia* developed to infective larvae during exposure to mean maximum air temperatures of 57°; of *Trichostrongylus*, to 61°; of *Cooperia* and *Oesophagostomum*, to 65°.

In those experiments in which infective larvae were obtained only after indoor culture following exposure, the exposed *Ostertagia* cultures yielded 46 percent as many larvae as found in control cultures, the *Trichostrongylus* cultures 10 percent, the *Cooperia* cultures 1 percent, and the *Oesophagostomum* cultures 0 percent. In those experiments in which the infective larvae developed outdoors, the exposed *Ostertagia* cultures yielded 65 percent as many larvae as the controls, the *Trichostrongylus* cultures 90, the *Cooperia* cultures 100, and the *Oesophagostomum* cultures 1 percent.

An active agent isolated from hogs affected with arthritis (preliminary report), S. H. McNUTT, T. S. LEITH, and G. K. UNDERBERG. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 21, pp. 247-251).—An apparently new pathogen for hogs is reported from a single herd. This agent had caused arthritis in field cases from which it was isolated, and in artificially exposed pigs produced arthritis, peritonitis, pleurisy, and pericarditis. Although it has been compared with several known viruses, no relationship has been found and it is not known to be a virus.

Studies on brucellosis of swine.—II, Exposure and reexposure experiments with *Brucella suis*, L. M. HUTCHINGS, A. L. DELEZ, and C. R. DONHAM. (Ind. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 22, pp. 11-20).—Continuing this series (E. S. R., 91, p. 745), it was found that of 19 sows previously exposed to *B. suis* as weanling pigs and re-exposed by intravenous or subcutaneous injections during their second pregnancies, 13 became reinfected as evidenced by increases in agglutination titers and recovery of *B. suis* from their blood streams. No abortions were observed in this group; however, 1 of these sows aborted at 57 days in her third pregnancy and *B. suis* was isolated from the aborted pigs, membranes, and uterine discharges.

Twelve yearling gilts and 3 second-pregnancy sows, not previously exposed to *B. suis* but kept as controls, were exposed to the same cultures on the same day as the 19 previously exposed sows. Of these controls, *B. suis* was isolated from the blood streams of 10 gilts and 3 sows, and all 15 developed positive serum agglutination titers but none aborted. In addition, 6 brucellosis-free yearling gilts which were exposed to transplants of the same cultures 2 mo. later at or near breeding time became infected and 1 aborted, while 2 others may have had unobserved abortions, since they failed to farrow.

Of 5 previously naturally infected sows, 3 became reinfected when fed infected aborted materials as the source of re-exposure. Six sows previously exposed to *B. suis* during their first pregnancy were re-exposed to *B. suis* by feeding small portions of aborted materials after their second breeding. *B. suis* was isolated from the blood of 3 sows, and increased agglutination titers were observed in 5 of the sows. Of 5 brucellosis-free yearling gilts used as controls for this re-exposure feeding experiment, all became infected, 2 aborted, and *B. suis* was recovered from the aborted pigs and membranes.

"In these experiments the hogs previously exposed to *B. suis* by either natural or artificial means were not as responsive to a second exposure as unexposed swine of comparable ages were to their first exposure, but the resistance or tolerance in these previously exposed animals was not sufficient to prevent reinfection."

Brucellosis of swine.—IV, The unit-segregation system of eradication, H. S. CAMERON. (Univ. Calif. coop. U. S. D. A.). (*Amer. Jour. Vet. Res.*, 7 (1946), No. 22, pp. 21-26).—This paper describes a unit segregation system of eradicating swine

under California conditions, based on data compiled from the swine herd of the State hospital previously referred to (E. S. R., 92, p. 417). The system is based on data showing that young pigs are usually not infected at weaning and on the efficiency of the test when applied to the herd. A positive unit consists of a group containing reactors and nonreactors of breeding age that have been exposed to infection. A negative unit consists of young pigs that have been segregated from the positive unit since weaning.

Studies on swine enteritis.—II, *Salmonella* and other enteric organisms isolated from diseased and normal swine, N. D. LEVINE, E. H. PETERSON, and R. GRAHAM. (Univ. Ill.). (*Amer. Jour. Vet. Res.*, 6 (1945), No. 21, pp. 242-246).—In a study of 227 swine presented for autopsy and diagnosis, approximately 55 percent of which showed gross inflammatory lesions of the lower intestinal tract, *Salmonella* organisms were isolated from 13 percent of the total and from 17 percent of those showing gross intestinal lesions. Nongas formers (Eberthella-like and Shigella-like species), members of the *Proteus* and *Paracolon* groups, and a further group not classified according to genus, were isolated from 153 of these swine. Organisms from the five enteric groups were not isolated from 65, or 29 percent of the total number of pigs. Of these 65 animals, 25 showed gross lesions of the lower digestive tract.

S. choleraesuis kunsendorf was the only organism isolated with consistency from the viscera. It is indicated, therefore, that of all bacterial groups and species, this organism may be the only one with marked invasive powers, and that the other species of *Salmonella* and the groupings of the enteric organisms found may represent primarily intestinal forms perhaps normal to the healthy porcine digestive tract. The pathogenicity of *S. choleraesuis kunsendorf* and *S. typhimurium* was demonstrated by feeding large amounts of the culture. *S. bareilly*, *S. give*, *S. illinois*, Eberthella-like, Shigella-like, *Proteus*, and *Paracolon* species and the unclassified group termed "slight gas formers" proved nonpathogenic to pigs following large doses by the mouth.

Of 194 strains of *Salmonella* organisms isolated from swine submitted for autopsy over a period of 4 yr., 134 were *S. choleraesuis kunsendorf*. The remaining 60 isolations consisted of a grouping of 14 *Salmonella* species. The "H" antigen agglutination titers of 110 swine blood serum samples did not indicate that any of the corresponding animals were suffering or had suffered from active infection with *S. choleraesuis kunsendorf*, *S. bredeney*, or *S. typhimurium*. Approximately one-third of these pigs showed gross lesions of the lower digestive tract.

Preventing and controlling disease among horses and mules, R. A. KELSER (*Chicago 5: Horse and Mule Assoc. Amer.*, 1946, pp. 15, illus. 8).—This address deals with a number of specific diseases, including the control of glanders, influenza, encephalomyelitis, periodic ophthalmia or "moon blindness," anthrax, tetanus, and dourine, and reports findings at the Front Royal (Va.) Remount Depot which indicated that periodic ophthalmia can be controlled by the daily admixture in the feed of 40 mg. of crystalline riboflavin.

Poultry diseases—their prevention and control, L. D. BUSHNELL and M. J. TWIEHAUS (*Kansas Sta. Bul.* 326 (1945), pp. 124, illus. 20).—This is a revision of Bulletin 284 (E. S. R., 82, p. 539).

Observations on the treatment of avian coccidiosis (cecal), W. T. S. THORP, J. FABRICANT, and M. LEARNED. (Pa. Expt. Sta.) (*Vet. Med.*, 41 (1946), No. 3, pp. 86-88, illus. 2).—This address presents data which are said to be preliminary but to indicate the beneficial effect of the sulfonamides.

Immunization against a lymphoid tumor of the chicken.—II, Use of centrifuged material, C. OLSON, JR. (Mass. Expt. Sta.). (*Cornell Vet.*, 35 (1945), No. 4, pp. 308-313).—Continuing this series (E. S. R., 94, p. 115), centrifugation was

studied as a means of separating, from tumor pulp, a water-soluble substance which would immunize against the tumor. In the course of six experiments in which 73 chickens received simultaneously standard minced tumor pulp and fractions from centrifugation, it was found that when a relative centrifugal force of 1,000 times gravity was used, the supernatant fluid was not capable of inducing growth except in a single experiment which "should probably be regarded as an exception." When the supernatant fluid was devoid of growth capacity, it also lacked the ability to induce immunity.

The life cycle of *Tamerlania bragai* Santos, 1934 (Eucotylidae), a kidney fluke of domestic pigeons, J. F. MALDONADO (*Jour. Parasitol.*, 31 (1945), No. 5, pp. 306-314, illus. 10).—The life cycle of this parasite is described in detail. *Subulina octona*, a land snail, acts as intermediate host.

AGRICULTURAL ENGINEERING

Principles of engineering thermodynamics, P. J. KIEFER and M. C. STUART (*New York: John Wiley & Sons; London: Chapman & Hall, 1944, pp. 545+*, illus. 135).—The authors present the basic aspects of thermodynamics which are of concern in the design and operation of the many varieties of power producing and transforming machines. The work is divided into five major parts. Part 1 considers the first law of thermodynamics, with particular emphasis on the distinctive characteristics of stored and transient forms of energy and the energy equation as it applies to the many steady-flow machines encountered in engineering practice. Part 2 considers the second law and the Carnot principle, with emphasis on the availability of energy and the associated physical significance of the entropy function as an index of the unavailability of energy. Part 3 describes the physical properties of vapors, gases, and their mixtures. Part 4 analyzes application of motive-power machinery and certain power-using apparatus with attention both to ideal performance and the character and reasons for the departure of actual performance from the ideal. Part 5 develops the general thermodynamic equations.

Tables of functions with formulae and curves (Funktionentafeln mit formeln und kurven), E. JAHNKE and F. EMDE (*New York: Dover Pubs., 1945, 4. ed., enl. and rev., pp. 306+*, about 212 illus.).—A collection of tables of the higher functions presented in the following order: (1) Sine, cosine, and logarithmic integral; (2) factorial function; (3) error integral and related functions; (4) theta-functions; (5) elliptic integrals; (6) elliptic functions; (7) Legendre functions; (8) Bessel functions; (9) the Riemann zeta-function; (10) confluent hypergeometric functions; and (11) Mathieu functions. Some often used constants, useful books for the computer, index of tables of the elementary transcendental functions, and a supplementary bibliography have been included to increase the usefulness of this work. In this new edition nearly 400 corrections of errors, and other changes, have been made. Practically all of these are contributions, either directly or indirectly, of R. C. Archibald, L. J. Comrie, and J. C. P. Miller.

Tables of associated Legendre functions (*New York: Columbia Univ. Press, 1945, pp. 303+*).—A compilation prepared by the Mathematical Tables Project conducted under the sponsorship of the National Bureau of Standards of associated Legendre functions to about six significant figures at intervals of 0.1. Tables of the

following mathematical expressions are given: (1) $P_n^m(\cos \theta)$, (2) $\frac{d}{d\theta} P_n^m(\cos \theta)$,

(3) $P_n^m(x)$, (4) $\frac{d}{dx} P_n^m(x)$, (5) $(-1)^m Q_n^m(x)$, (6) $(-1)^{m+1} \frac{d}{dx} Q_n^m(x)$, (7) $i^{-n} P_n^m(ix)$,

- (8) $i^{-n} \frac{d}{dx} P_n^m(ix)$, (9) $i^{n+2m+1} Q_n^m(ix)$, (10) $i^{n+2m-1} \frac{d}{dx} Q_n^m(ix)$, (11) $P_{n+\frac{1}{2}}^m(x)$,
 (12) $\frac{d}{dx} P_{n+\frac{1}{2}}^m(x)$, (13) $(-1)^m Q_{n+\frac{1}{2}}^m(x)$, (14) $(-1)^{m+1} \frac{d}{dx} Q_{n+\frac{1}{2}}^m(x)$, (15) exact values
 of $P_n^m(x)$ and $\frac{d}{dx} P_n^m(x)$, (16) exact values of $P_n^m(x)/(x^2-1)^m$ and of $\left[\frac{d}{dx} P_n^m(x)\right]/$
 $(x^2-1)^{\frac{1}{2}m-1}$, (17) values of $\sqrt{x^2-1} P_{n+\frac{1}{2}}^m(x)$ and of $\sqrt{x^2-1} \frac{d}{dx} P_{n+\frac{1}{2}}^m(x)$, (18) Leg-

endre normalizing factor N_n^m , and (19) first 11 coefficients in the expansion of $CF(m+\frac{1}{2}, \frac{1}{2}-m; n+3/2; -i)$.

Engineering materials annual, 1944, edited by H. H. JACKSON (*London, W. C. 2: Paul Elek Ltd., 1944, pp. 108*).—A concise review of developments in the various branches of engineering during the past year, together with a bibliography of references for detailed information requirements. Discussion of the following specific fields are presented: Iron and steel, nonferrous metals, plastics, rubbers (natural and synthetic), solid fuels, gaseous fuels, ceramics, lubricating oils and greases, glass, plywood and adhesives, precious metals, and refractories.

Handbook of material trade names, C. T. ZIMMERMAN and I. LAVINE (*Dover, N. H.: Indus. Res. Scr., 1946, pp. 503+*).—Since the majority of the products of our mills and factories reach the market under names that often give no indication as to the nature or use of the products, the authors have devised this publication in an attempt to furnish desired information to the inquirer with the minimum amount of time and effort. An alphabetical listing of trade name materials in all fields is presented, together with each material's properties, uses, and the identity, with address, of the manufacturer or distributor of the product.

1945 Supplement to A. S. T. M. Standards, including tentatives.—Part III, Nonmetallic materials—general (*Philadelphia 2: Amer. Soc. Testing Mater., 1945, pt. 3, pp. 505+, about illus. 145*).—This supplement contains the newly adopted and revised standards and the new and revised tentatives in the nonmetallic general materials field that have been accepted since the appearance of the 1944 Book of Standards, Part III.

A. S. T. M. Standards on petroleum products and lubricants (with related information) (*Philadelphia 2: Amer. Soc. Testing Mater., 1945, pp. 546+, about 135 illus.*).—This publication brings together the 1945 Report of Committee D-2 on Petroleum Products and Lubricants, the various A. S. T. M. standard and tentative methods of test and specifications pertaining to petroleum, and the regulations and personnel of Committee D-2 and its subcommittees and technical committees.

Waterproof coating for plant records, C. B. WESTERHOFF (*Chem. and Metall. Engin., 52 (1945), No. 12, p. 120*).—Written or typed regular paper reference records, log sheets, calibration curves, or formula cards that receive considerable handling can be prepared for durable service in a few minutes by dipping in a solution prepared from the following formula: Polystyrene 10 parts, carbon tetrachloride 90 parts. One dipping is sufficient, although it is recommended that for hard wear the sheet should be dipped a second time. The coating dries in a few minutes to a flexible leather-like finish which can be washed when and if necessary. The polystyrene can be made by polymerizing styrene monomer at 100° C. with a little benzoyl peroxide as catalyst. If available, scrap plastic pieces are convenient to use. A solution of the two ingredients is best obtained by heating and allowing the carbon tetrachloride to reflux for a sufficient length of time.

Adhesion factors evaluation, R. F. SNIDER (*Ohio State Univ., Abs. Doctoral Diss., No. 47 (1945), pp. 67-86, illus. 12*).—Studies of joint strength of the following

woodworking adhesives, liquid hide glue, liquid fish glue, casein glue, soybean glue, and urea resin glue were made to ascertain the effects on joint strength of: Clamping pressure, (2) closed assembly time, (3) inaccurately finished joints stimulated by the placement of metal separators between the sides of the joint, and (4) grain direction on shear strength and wood failures. Results obtained indicated the conclusions that, with all types of glue tested except urea resin, the only purpose of clamping pressure was to maintain a sound glue line film by preventing warping of the lumber, and any increased penetration caused by higher pressures did not seem to increase strength. The penetration of urea resin glue into the cell wall structure was responsible for its high wood failure, and with glue films of less than 0.006 in. thickness strong joints can be expected if they are properly seasoned. Decrease of strength in inaccurately finished joints is largely due to the greater internal stress from the loss of solvent, but this strength can be increased by using longer closed assembly periods or a glue of higher glue solids content.

Bitumen-aggregate adhesion: Modification by chemical treatment, J. M. SWANSON. (Univ. Wis.). (*Indus. and Engin. Chem.*, 36 (1944), No. 6, pp. 584-588, illus. 1).—Methods of increasing water-displacement properties and adhesion of bituminous materials toward commercial road aggregates are discussed from the standpoints of efficiency and practicability. Specific modifications of the general method suggested by McLeod—that of treating the aggregate with solutions of a heavy metal salt and a soluble soap in such a way as to produce a coating of insoluble soap which is better wetted by bitumen than by water—were developed as promising for practical road construction. This type of treatment was applied to plant mixes, and the process tested on a small scale in the field. Details of the procedure are presented. The successes and failures of the road panels are briefly considered.

In general, the bituminous materials could be made to coat water-wetted aggregate in a manner such as to produce a highly water-resistant mix at a reasonable cost by the modified method described. As developed, the treatment may have possibilities for application in road construction where uniformly thin mattes can be laid and adequate drainage assured. In special applications where a water-resistant mixture of bitumen-coated aggregate is desired and where the plastic properties of the mass do not constitute a problem, the treatment should be useful.

Corrosion tests determine wire fence durability, B. A. JENNINGS. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, pp. 1, 6, illus. 1).—Preliminary data covering 9 yr. of replicated exposure tests of wire farm fencing in several States indicate that for a given exposure condition copper-covered wires have not rusted, lead-coated samples have numerous small rust spots at various places on the wire, corrosion-resistant wires are as bright and shiny as the day erected, but zinc-coated wires have a fairly constant loss of protective coating per year. At Pittsburgh, Pa., the rate of loss of zinc per square foot of wire surface per year is reported at 0.0369 oz.; at Sandy Hook, N. J., 0.150; and at State College, Pa., and Ithaca, N. Y., about 0.06. As more complete information is obtained, establishing average life of coatings and strength of basic wire materials after rusting, definite total expected service fences can be specified and acquired with considerable savings to farmers.

"Concrete shell roofs with flexible moulds," K. BILLIG (*Jour. Inst. Civil Engin. [London]*, No. 25 (1945-46), pp. 228-231, illus. 2).—The author reports on the military application of large-span concrete shell roofs constructed over a covering of fabric. The constructional procedure consists essentially of tubular steel scaffolding ribs at definite spacings, formed to the exact curvature of the future shell over which is stretched a covering sewn from jute, coir, sisal, or burlap fabric. The fabric is then wetted, and thin layers of 1 : 3 mortar are applied in layers until the required thickness of usually 2 in. is obtained. Scaffolding is then removed for use at new

sites. Corrugated shell arch buildings, formed by the natural sag of the fabric between the supporting ribs, have arches of inverted catenary shape which are free from all static tensile strength and are naturally stable, requiring no reinforcement or timber. The same principle has been applied to shell structures of the Dywidag type which utilizes high-tensile reinforcing wires covered with fine wire mesh supported by tubular steel scaffolding. Construction is accomplished by the application of a thin coat of mortar to the wire mesh mold, allowing it to harden, then successive mortar layers are applied until the required thickness is reached. Upon hardening the supporting scaffolding can be removed. Average cost per unit for structures built by these methods having spans of 89 ft., heights of 20 ft., and lengths of 56 ft. are reported at £360.

Manual for water plant operators, A. A. HIRSCH (*Brooklyn: Chem. Pub. Co., 1945, pp. 386+*, *illus. 50*).—A practical text and reference manual for operators of water supply systems. The author presents all information in an intimate and definitive manner covering the latest developments in water technology as well as the broader aspects of the subject matter which a truly competent operator should know.

Fully mechanized farming on the agronomic unit basis, R. E. HORTON (*Soil Sci. Soc. Amer. Proc.*, 9 (1944), pp. 225-232).—"This paper presents the views of an engineer regarding economic problems of farming practice which center around mechanization. Farming, especially the growing of field crops, is in many respects an engineering industry. . . . Heretofore attention has been devoted largely to developing details of mechanized farming. It seems that the time has arrived when more attention should be given to its ultimate economic prospects and problems."

The topics specifically dealt with are: Unification and mechanization, the agronomic farming unit, load factor and crop timing, organization of a farming unit, enabling acts, working capital, management, labor, size and layout of farming unit, conservation and crop insurance, gullied and worn out lands, and the future.

Protection for electric motors, E. S. SHEPARDSON (*N. Y. State Col. Agr., Cornell Ext. Bul.* 673 (1945), pp. 12, *illus. 12*).—A practical discussion of standard overload protective devices for electric motors. Typical installation examples with corresponding recommendations are given.

Farm tractor maintenance, I. G. MORRISON (*Danville, Ill.: Interstate, 1946, pp. 202, illus. 156*).—A compilation of information on farm tractor maintenance and care for use by the farm operator, student, and teacher in vocational agriculture and others interested in tractors. The author presents this informative material by subdivision into six sections. Discussions under each of these sections are as follows: (1) The meaning of preventive maintenance, tractor construction, and fuel oils and greases; (2) maintaining the power plant, carburetor, and the lubricating, cooling, and electrical systems; (3) servicing the engine and chassis; (4) general suggestions for tractor operation, operation in cold weather, and safety precautions; (5) trouble-shooting guide; and (6) storage of the tractor and preparing for service after storage.

The "jeep" in Mississippi agriculture, T. N. JONES (*Miss. Farm Res. [Mississippi Sta.]* 8 (1945), No. 12, pp. 1, 7, *illus. 5*).—Results of tests conducted at the station to determine the adaptability to farm-operating conditions of the military and post-war models of the jeep indicate that the military model, as constructed, is not satisfactory for pulling farm implements but will pull trailers and light implements which permit speeds of approximately 6 miles per hour. Since this model has no power take-off or belt pulley its use is limited. The peace model (CJ-2), however, has been redesigned incorporating a power take-off, a governor, and a lower gear ratio permitting operating speeds in low-range, first gear at 3.5 miles per hour. These changes enable this model to do many farm jobs such as disking, harrowing,

mowing, raking, towing trailers, belt work, carrying passengers, and serving as a light truck. No tests are reported on middle busting, planting, or cultivating operations. The cost of the improved peace model complete with extra equipment to enable it to do the many jobs it is capable of doing is reported at near \$1,400. Comparing this price with that of a medium size tractor or a pick-up truck, it appears that the price of the jeep is not in line with comparable equipment.

A fiber blender, R. E. STEWART (*Textile Res. Jour.*, 15 (1945), No. 12, pp. 468-469, *illus. 1*).—A mechanical laboratory device developed to prepare homogeneous samples of cotton for various fiber tests. The instrument consists primarily of two wooden rolls covered with stripper wire which are hand-driven through suitable gearing. The rolls are covered in such a way that the wires point in opposite directions on the two rolls, which arrangement gives teeth pointing in the same direction where the teeth intermesh. Through manipulation of the rolls by their respective cranks fiber samples can be opened, cleaned, mixed, and recollected.

Fibrograph tests to determine whether any fibers were broken in the device indicated that they were not damaged.

Improvements in equipment for killing both larvae and adult mosquitoes with DDT, F. W. KNIFE (*Agr. Engin.*, 26 (1945), No. 11, pp. 459-462, 464, 468, *illus. 6*).—"This report describes improvements in types of equipment which may be used to spread DDT as a mosquito-control measure. The use of DDT as a mist spray is discussed. Improvement in mechanical distribution for larviciding purposes and development of technics of application to secure maximum residual effect against adult mosquitoes are reviewed."

Floor plans for small cooperative dairy plans, D. D. BRUBAKER (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 93* (1945), pp. 10+, *illus. 29*).—A collection of suggested plans for use of those who contemplate building or remodeling small plants.

Cold storage for apples and pears, W. V. HUKILL and E. SMITH (*U. S. Dept. Agr. Cir. 740* (1946), pp. 61, *illus. 25*).—This is a collection of the essential features in the design and operation of cold-storage plants and in the handling of stored fruit which apply particularly to the Pacific Northwest, though all the principles presented apply equally to other parts of the country. The authors present the material in as concise and as nontechnical language as is possible and treat the subject matter by discussion of the following major segments: (1) Use of cold storage for fruit, (2) response of fruit to storage conditions, (3) storage behavior of apples and pears, (4) cold-storage plants and equipment, (5) cold-storage design, and (6) cold-storage management and plant operation.

Rapid cooling and uniformity of temperature were found to depend upon adequate capacity and close attention to detail in design and upon judicious operation based on an understanding of storage principles. Sufficient refrigeration must be available to cool fruit as fast as it comes in. Quick reduction to optimum storage temperature arrests ripening processes and lengthens storage life. A temperature of 30° to 32° F. and a relative humidity of 85 to 88 percent give the best results for most apple varieties in most sections. For each 1,000 boxes of apples received into storage daily at 65° approximately 8 tons of refrigeration is required to absorb field heat in fruit, heat of respiration, building heat leakage, and incidental heat (motors, infiltration, workmen, etc.). Air circulation must be sufficient to distribute refrigeration without excessive temperature rise—at least 1,000 cu. ft. of air per minute for each ton of refrigeration in blower circulating systems. The arrangement of a storage room and the location of coils or air ducts must prevent local warm spots and provide air circulation at all points at minimum power cost. Economy of installation and operation govern choice for fruit refrigeration among several types of systems: Direct-expansion, brine-pipe, dry-coil bunker, brine-spray, and unit-cooler.

Literature cited includes 26 references on the storage behavior of fruits and refrigeration engineering.

Fuel savings resulting from use of insulation and storm windows. A. P. KRATZ and S. KONZO (*Ill. Engin. Expt. Sta. Bul. 355 (1944), pp. 40, illus. 13*)—A report of heating investigations conducted in the Warm Air Heating Research Residence in Urbana, Ill., with the cooperation of the National Warm-Air Heating and Air Conditioning Association. The test objectives were to determine, under actual service conditions over a wide range of outdoor temperatures, the savings in fuel that could be effected by insulating a typical residence and by equipping it with storm windows and a storm door; to compare the actual savings so effected with those estimated from heat loss calculations, employing commonly accepted values for the coefficients of heat transmission and air infiltration; and to determine the effect of insulation and storm windows on the performance of the heating plant and on the comfort conditions maintained in the residence.

In severe weather a saving of 22 percent in the fuel required to heat the uninsulated residence was effected by the use of storm windows and a storm door. The actual savings were about 81 percent of the estimated savings based on the calculated heat losses from the building. Further advantages effected by the use of storm windows included a reduction in the amount of cold air in leakage and down drafts of air over the windows, thus resulting in greater comfort; the elimination of condensation appearing on the windows in severe weather when comparatively high relative humidities were carried; and the elimination of soot leaking in at the cracks around the sash.

The use of 5½-in. thickness of mineral wool insulation in the residence, without the addition of storm windows, resulted in an actual saving of approximately 30 percent, or about 78 percent of the estimated savings based on the calculated heat loss from the residence. When both storm windows and insulation were used, the actual savings amounted to 45 percent, or about 68 percent of the estimated reduction. Further advantages resulting from the use of insulation included a marked increase in the inside surface temperature of the insulated walls, with a corresponding increase in comfort, a reduction in flue gas temperatures, and a reduction in time of operation of the stoker motor and fan motor.

Reading list on housing (*Washington: U. S. Natl. Housing Agency, Inform. Serv., 1945, pp. 18*).—A collection of references.

AGRICULTURAL ECONOMICS

Report of the Chief of the Bureau of Agricultural Economics, Fiscal Year 1945. H. R. TOLLEY (*U. S. Dept. Agr., Bur. Agr. Econ. Rpt., 1945, pp. 23, illus. 4*).—This is the annual report to the Secretary of Agriculture for the fiscal year ended June 30, 1945. The work during the year "centered on problems of the agricultural economy in the last stages of the global war and the first stages of the return to peace. Major activities, in peace or war, include the collection of primary data and statistics, economic analysis and research, service work, program development, and the dissemination of information."

Graphs and tabular and other data are given on farm population, farm incomes, employment, prices, farm production per worker, land settlement, farm wages, the farmer's share of the retail cost of farm food products, farmer opinion on postwar problems, and price-analysis studies with potatoes and meat.

Report of the Chief of the Agricultural Adjustment Agency, Director of the Field Service Branch, 1945. N. E. DOWD (*U. S. Dept. Agr., Agr. Adjust. Agency Rpt., 1945, pp. 39+, illus. 1*).—This report to the Secretary of Agriculture for the fiscal year ended June 30, 1945, was submitted by the Director of the Field Service

Branch of the Production and Marketing Administration into which the Agricultural Adjustment Agency was incorporated by Secretary's Memorandum No. 1118 of August 18, 1945. The 1945 programs are discussed in sections covering agricultural conservation in the different regions and insular areas, and the naval stores, seed, flaxseed, and sugar programs; production goals; marketing quotas; crop insurance; production payments; commodity loans; commodity purchases; and special services—surplus property, farm machinery, other war jobs, and feed distribution. The farmer set-up for administering the AAA programs and the major items in the 1946 program are briefly described. The financial report of the AAA for the fiscal year is included.

[Papers and notes on agricultural economics] (*Jour. Farm Econ.*, 27 (1945), Nos. 2, pp. 245-508, illus. 5; 3, pp. 509-736, illus. 7).—No. 2 includes the following papers: Major Shifts in World Agriculture, by C. M. Purves (pp. 245-260), and Agricultural Production After the War, by S. E. Johnson (pp. 261-280) (both U. S. D. A.); Postwar Agricultural Credit Problems and Suggested Adjustments, by E. L. Butz (pp. 281-296) (Purdue Univ.); Agricultural Marketing Programs After the War, by F. V. Waugh (pp. 297-302); The Cost of Subsistence, by G. J. Stigler (pp. 303-314) (Univ. Minn.); Advances in the Techniques of Measuring and Estimating Consumer Expenditures, by D. S. Brady and F. M. Williams (pp. 315-344); Notes on "Poor Land," and "Submarginal Land," by J. D. Black (pp. 345-374); The Marginal Feed Cost of Pork and Lard, by L. J. Atkinson (pp. 375-387) (U. S. D. A.); Postwar Agricultural Settlement Possibilities in Canada, by W. B. Hurd (pp. 388-404); Postwar Land Settlement Opportunities in the Northern Great Plains, by H. A. Steele (pp. 405-418) (U. S. D. A.); Labor Productivity in Agriculture in USSR and USA, by N. Jasny (pp. 419-432); Interterritorial Freight Rate Differences in Relation to the Regionalization of Industry, by R. L. Dewey (pp. 433-452) (Iowa State Col.); and Research in Milk Marketing—A Review, by L. J. Steck (pp. 453-462). The following notes are included: Consolidated Balance Sheet and Income Statement for Agriculture, by R. J. Burroughs (pp. 463-472), and Trends in Major Cropland Use in the United States, 1909-1941, by M. Clawson (pp. 472-476) (both U. S. D. A.); and A Postwar Forward Pricing Plan for Agriculture, by A. R. Aandahl (pp. 476-482).

No. 3 includes the following papers: Farm Technological Advance and Total Population Growth, by J. M. Brewster (pp. 509-525) (U. S. D. A.); Research Determination of Economies of Scale, by R. G. Bressler, Jr. (pp. 526-539) (Univ. Conn.); Costs of Federal Agricultural Activities—Their Meaning and Classification for Purposes of Economic Analysis, by E. F. Shepard (pp. 540-552) (U. S. D. A.); War-Time Price Control of Fresh Citrus Fruits, by J. W. Reitz (pp. 553-570); A Proposed World Trade Board for Expanding International Trade, by F. F. Elliott (pp. 571-590) (U. S. D. A.); Agricultural Credit Policy in the United States, 1945, by J. D. Black (pp. 591-614); The Agricultural Economics Program of China, by P. C. Chao (pp. 615-619); A Public Farm Land Appraisal Service—Its Desirability and Practicability, by K. Brandt (pp. 620-633); Old-Age Security for the American Farm Population, by D. K. Andrews (pp. 634-648) (Ohio State Univ.); How Would a Federal Sales Tax Affect Farmers? by T. F. Haygood (pp. 649-663), and Postwar Planning and the Rural-Urban Balance, by A. P. Chew (pp. 664-675) (both U. S. D. A.). Notes are included as follows: Mortgage Insurance for Farm Housing, by R. J. Burroughs (pp. 676-682), Notes on "The Economies of Public Measures to Subsidize Food Consumption," with an Extension of the Economic Principles Outlined to Individual Commodities, by H. S. Kahle (pp. 683-686), Procedures of Studying Returns From Conservation Farming, by G. W. Collier (pp. 686-694), and Farmers Regional Purchasing Cooperatives Look to Research, by M. A. Abrahamsen (pp. 694-700) (all U. S. D. A.); The Structure and

Function of Agricultural Export Trade in the Egyptian Economy, by Mohammed El Said Mohammed (pp. 700-701) (Univ. Calif.); The Application of Motion and Time Study Techniques to Certain Agricultural Enterprises, by J. W. Oberholtzer (pp. 702-704) (Purdue Univ.); The Evaporated Milk Industry Under Federal Marketing Agreements, by B. A. Baker (pp. 704-707) (Univ. Wis.); and Connecticut's Research in Milk Marketing—Another Opinion, by F. V. Waugh (pp. 707-709) (U. S. D. A.).

[Investigations in agricultural economics at the North Carolina Station] (*Res. and Farming [North Carolina Sta.]*, 4 (1945), *Prog. Rpt. 1*, pp. 2-3, 6, *illus.* 2).—An article, Cost of Producing Broilers, by R. E. L. Greene and H. B. James (pp. 2-3), includes a table showing by items the estimated cost per pound of producing broilers in the summer, fall, and winter during the year ended May 15, 1945, as 26.1, 25.2, and 24.9 ct., respectively. The cost in the fall of 1945 was estimated to be 28 ct. An article, The War Has Not Put N. C. Farmers Out of Business, by G. F. Vogel and W. A. Hendricks (p. 6) (coop. U. S. D. A.), presents tables showing by years, 1940-43, the active, subsistence, and idle farms in 200 sample townships of the State, and the total cropland and cultivated cropland on the farms. They concluded that there is no evidence that the North Carolina farmers are going out of business.

Current Farm Economics [December 1945] (*Cur. Farm Econ. [Oklahoma Sta.]*, 18 (1945), No. 6, pp. 125-156, *illus.* 2).—In addition to the usual review of the agricultural situation and tables of indexes of prices and purchasing power of Oklahoma farm products, the following articles are included: Land Tenure and Pasture Conservation, by P. Nelson (pp. 141-145), making an interpretation of certain cattle grazing results obtained at the U. S. D. A. Southern Great Plains Field Station at Woodward, Okla.; and Social Security for Farmers and Farm Workers, by O. D. Duncan (pp. 146-154), discussing whether farmers want a social security program, and, if so, how the present program must be changed to fit the conditions of farm life and employment.

Foreign Agriculture [January 1946] (*U. S. Dept. Agr., Foreign Agr.*, 10 (1946), No. 1, pp. 16, *illus.* 4).—The following articles are included: The United Nations Food and Agriculture Organization, by J. A. Becker (pp. 2-6); Danish Agricultural Production—World War I and World War II, by K. J. Friedmann (pp. 7-11); and Vanilla-Bean Production and Trade, by H. B. Whitmore (pp. 11-16), noted on page 762.

The farm real estate situation, 1944-45, M. M. REGAN, A. R. JOHNSON, and F. A. CLARENBACK (*U. S. Dept. Agr. Cir. 743* (1945), pp. 47, *illus.* 9).—This is a continuation of the series (*E. S. R.*, 93, p. 86).

Average per acre of farm land values on March 1, 1945, for the United States as a whole were 11 percent higher than on March 1, 1944, bringing values to a level 52 percent above the 1935-39 average. The increase varied from 7 percent for New England to 14 percent for the South Atlantic and Pacific geographic divisions. By July 1, 1945, values had increased an additional 3 percent. Current values on July 1, 1945 were about one-fourth below the 1920 level. They were above the 1920 level in one-sixth of the States and equal to or above 1919 levels in one-half of the States. The volume of voluntary sales during the year ended March 1945 decreased 8 percent from the previous year's peak, but the volume was about three-fourths above the 1912-14 and 1935-39 averages and higher than any other year except 1943-44. During the last half of 1944 and first quarter of 1945 more than one-eighth of all sales were resales of farms acquired within 2 yr. For 1944, approximately two-thirds of the resales had been held less than a year and about two-fifths less than 6 mo. During the year ended March 1945, active farmers were buyers in 63 percent of the sales. The upward trend in the proportion of sales by owner-operators continued,

but there was a sharp decrease in the sales by corporations. Of all recorded sales, 55 percent were for cash. Down payments on sales financed by mortgages continued to average about two-fifths of the purchase price. Between one-fourth and one-third of all credit-financed sales were encumbered to 75 percent of the sales price and about three-fourths about 50 percent or more. Prices received by farmers and cash farm incomes during 1944 averaged slightly above 1943.

Prices during the first 6 mo. of 1945 averaged about 3 percent above the same period in 1944, and were expected to continue at high levels during the remainder of the year. "In the summer of 1945, demand deposits of country banks in 20 leading agricultural States were up about one-fourth from a year earlier and at a level more than three times that of 1941. Total liquid assets held by farmers, including war bonds and bank deposits, now amount to approximately 17 billion dollars, as compared with about 4 billion at the beginning of 1940." Postwar land values during the immediate postwar years and the long-time influences on such prices are discussed briefly.

Father-son farm business agreements, J. B. CUNNINGHAM and H. C. M. CASE (*Ill. Agr. Col. Ext. Cir. 587 (1944), pp. 23+*, illus. 3).—The essential conditions underlying father-son farm business agreements are briefly described. Three plans are outlined, with a form of agreement covering each type.

Agricultural production to meet 1946 needs, G. H. AULL and M. J. PETERSON. (Coop. U. S. D. A.). (*South Carolina Sta. Cir. 70 (1945), pp. 43, illus. 11*).—This circular is based upon a report prepared by the South Carolina Committee on Production Adjustments in Agriculture. The impact of the ending of World War II on 1946 production and the outlook are discussed briefly. The opportunities for crop and livestock adjustments, the need for improved practices, a cropping pattern to meet 1946 requirements for different crops, livestock production for 1946, forest products, and marketing and distribution of the leading products are discussed in more detail.

More production through better practices, D. M. KEYES. (Coop. U. S. D. A.). (*West Virginia Sta. Bul. 320 (1945), pp. 21*).—The requirements for the usual production practices in Upshur County for corn, hay, pasture development, dairying, poultry, beef cattle, and sheep are discussed and contrasted with recommended and maximum levels for each practice. The usual practices were those reported by 96 farmers interviewed. The recommended levels were those recommended by specialists for successful operation. The maximum levels were those "suggested by the specialists as needed for the greatest production; i. e., the point beyond which further outlay of time and materials would fail to give additional increases in production."

The balance sheet of agriculture, 1945, A. S. TOSTLEBE, D. C. HORTON, R. J. BURROUGHS, H. C. LARSEN, and L. A. JONES (*U. S. Dept. Agr., Misc. Pub. 583 (1945), pp. 44, illus. 11*).—This is the first of a series of annual reports whose purpose is to carry forward the comparative consolidated balance sheet of agriculture published for the years 1940-44 in Miscellaneous Publication No. 567 (E. S. R., 94, p. 266).

The discussion covers the asset items—farm real estate, non-real-estate physical inventories (livestock, crops on farms, and machinery and motor vehicles), and financial assets (warehouse receipts, bank deposits, currency, U. S. savings bonds, equity in cooperative associations, etc.); and the equity items—farm real estate debt, non-real-estate farm debt, and proprietary equities. Summary analyses are included of farm income, how the assets changed in 1944, price v. quantity changes, how the equities changed, financial ratios, and the significance of financial changes.

Farm opportunities in the United States: Outlook, problems, policies (*U. S. Dept. Agr., Interbur. Com. on Postwar Programs, 1945, pp. 129+*, illus. 12).—"The

preparation of this report was undertaken by the Land Settlement Work Group of the Interbureau Committee on Postwar Agricultural Programs to obtain an overall appraisal of farming opportunities immediately after the war, particularly as they relate to the interests of returning veterans. The report calls attention to some of the economic, social, and physical problems to be solved in filling the vacancies created by retirement, death, or change in occupation of farmers on existing farms. It analyzes various settlement policies and programs; discusses problems incidental to the development and occupancy of new farms; and lists some of the factors responsible for success or failure in establishing farmers on farms."

The economics of broomcorn production in New Mexico, M. EVANS (*New Mexico Sta. Bul. 326 (1945)*, pp. 45).—This bulletin is based on published data of the U. S. Department of Agriculture, Bureau of the Census, Department of Commerce, and other agencies; information secured from producers, handlers, processors, agencies financing production, and State and Federal agencies; and interviews in 1945 in Roosevelt, Curry, and Quay Counties regarding production practices, labor and material requirements, cultural methods, varieties, costs, disposal of crop, etc. Among the subjects discussed are the acreages, yields, and production; prices and income from broomcorn; varieties; production methods; quality of broomcorn produced; storage and shed curing; grading; normal and 1944 production costs; and the place of broomcorn on eastern New Mexico farms. The harvested acreage of broomcorn in New Mexico increased from 20,000 acres in 1919 to 82,000 acres in 1944, and the production from 4,000 to 12,300 tons. The average yield from 1919 to 1944 was 278 lb. per acre and the average price was \$95.73 per ton. The value per acre averaged \$13.41, ranging from \$2.40 in 1932 to \$28.21 in 1942. In 1944, on the basis of current labor and expenses, the average cost of production to the owner-operator was in excess of \$125 per ton and to the crop share renter more than \$140 per ton.

Looking ahead with cotton: Some trends and some choices (*U. S. Dept. Agr., Misc. Pub. 584 (1945)*, pp. 22+, illus. 17).—This publication, prepared by the Bureau of Agricultural Economics and the Extension Service, discusses the trends in cotton production, the competitors of American cotton, the problem of price of cotton, the balance between agriculture and industry in the South, and some of the choices of policy regarding cotton.

What of Alaska? W. A. ROCKIE (*U. S. Dept. Agr., Soil Conserv., 11 (1946)*, No. 7, pp. 147-153, 160, illus. 7).—The Territory is divided into 17 land resource areas and each described briefly. A table shows the estimated acreage in each land resource area in each of the eight land capability classes.

The McKenzie and Muddy Creeks irrigation projects: A study of two irrigation projects in the Willamette Valley, E. L. POTTER, A. JOSS, D. C. MUMFORD, and H. L. THOMAS. (Coop. U. S. D. A.). (*Oregon Sta. Cir. 168 (1945)*, pp. 30).—This circular reports what is being done by two groups of farmers who have opportunity to get irrigation water conveniently and at relatively low cost. The water is used on small fields scattered through large areas of nonirrigated land, and more than half of the irrigated lands are in Ladino clover for dairy cow pasture.

Sheep ranching in southeastern New Mexico, H. B. PINGREY (*New Mexico Sta. Bul. 325 (1945)*, pp. 64, illus. 7).—"The purposes of this study were: (1) To secure data of the physical and financial organization of sheep ranching in southeastern New Mexico; (2) to obtain data pertaining to the income and expense of sheep ranching for the 5-yr. period, 1938-42; (3) to estimate from the data collected the income and expenditures for an economic-sized family sheep ranch unit; and (4) to calculate the productive value of range land for sheep ranching within the area when such land is conservatively grazed and when a normal price level for lamb and wool prevails." Data for the period 1938-42 for eight sheep ranches

varying from 7 to 42 sections of land are analyzed. The method of making the study; the topography, water facilities, vegetation, and market and transportation facilities of the area; and the climatic and economic conditions during the period studied are described. Analyses are made of the size of ranch, distribution of capital, and numbers and kinds of livestock grazed; and returns and variations on invested equity, income per section of land, production and value of wool and mutton, cash operating expense—amount and cost of labor, and feed and lease expense, etc. The management practices, productive value of range land, size of ranch unit necessary to support a family, and when to buy a sheep ranch are discussed. Some of the findings were:

"The invested capital averaged \$2,876 per section of land, and was divided as follows: Land, \$1,258; improvements, \$826; equipment, \$50; livestock, \$731; and feed, \$11. Indebtedness, which was \$321 per section, was 11 percent of the total invested capital." An average return for the 5-yr. period of 6.6 percent was earned on a net equity investment of \$2,555 per section of land, varying from 3.2 to 13.8 percent in the different years. The net income per section varied from \$177 in 1938 to \$436 in 1942, averaging \$269 for the 5-yr. period. Cost per acre of grazing land, including interest and taxes, were: Deeded land 23.17 ct., leased State land 12.5 ct., and Federal or Taylor grazing land 10.75 ct. The productive value of range land during the 5-yr. period was determined to be \$2,800 per section. "A family-sized sheep ranch unit should be large enough that the ranch operator, without overgrazing and depleting the range, can meet the necessary expense of operation; provide a reasonable standard of living; and pay for the land within his period of active and productive life. In southeastern New Mexico, at normal price levels for wool and lamb, a minimum of 1,700 head of sheep would be necessary to achieve these aims. At a carrying capacity of 17 animal units per section, the ranch should be at least 20 sections in size. The operation of such a unit would involve a capital investment of about \$53,000. With an annual return to land of \$66.70 a section, it would take about 36 yr., or the productive lifetime of an individual, to recover his invested capital of \$1,112 a section, together with 5 percent on this value."

Simplifying the work and management of hog production, J. W. OBERHOLTZER and L. S. HARDIN (*Indiana Sta. Bul. 506 (1945)*, pp. 31, illus. 18).—Detailed case studies were made through frequent visits from March 1 to November 1, 1943, of five farms having highly successful and efficient commercial hog enterprises. The five farmers averaged 1.7 hr. of work per hog sold as compared to 6.7 hr. for the State. The following factors contributing to doing hog work easily, quickly, and effectively are discussed: Size of enterprise; providing clean pasture and housing; providing water; storage, preparation, and handling of feed; equipment and buildings; adequate care at critical periods; and small savings of time and effort through farrowing house arrangement, combining jobs, and labor-saving devices.

Feed for Kentucky livestock: Amounts of livestock and feed produced, and sources of purchased feed, J. B. ROBERTS (*Kentucky Sta. Bul. 480 (1945)*, pp. 43, illus. 19).—Discussions are included of the amount of livestock in the State and the trends and county differences in livestock production; the county differences and trends in feed production in the State, the trends in livestock-feed ratios, the inadequacy of supply, and the procurement of feed within the State; the sources of importations of feed grains, including distribution of grains, hay crops, and livestock in the United States, special attention being given to Ohio, Indiana, Illinois, and Kentucky, and the trucking in of feed grain; the volume of purchases, location of suppliers, marketing methods, and quality requirements for commercial feeds; and the economic importance of purchased feed.

Report of the Director of the Office of Marketing Services, 1945, C. W. KITCHEN (*U. S. Dept. Agr., Off. Market. Serv. Rpt., 1945, pp. 92*).—This is the annual report to the Secretary of Agriculture. The agency was established January 1, 1945, as a part of the War Food Administration, but upon the abolishment of the War Food Administration on June 30, 1945, became an agency of the Department. The report, which is for the fiscal year ended June 30, 1945, covers "only work done during the full year in the performance of those functions that were transferred in the middle of the year from the Office of Distribution to the Office of Marketing Services. Moreover, it excludes work done in the performance of functions that during the last half of the year were transferred from the Office of Marketing Services to other Department agencies." It describes the functions of the Service at the end of the fiscal year, and discusses the work under the headings of civilian distribution; coordination of nutrition programs; cooperation with the food industry; marketing facilities; cotton and fiber; dairy products, eggs, and poultry; fats and oils; fruits and vegetables; grain; livestock, meats, and wool; sugar; tobacco; and other commodities.

Effects of State and Federal milk marketing orders in Cincinnati and Toledo markets, C. G. McBRIDE (*Ohio Sta. Bmo. Bul. 237 (1945), pp. 192-194*).—The effects of the orders issued by the Ohio Milk Marketing Commission under the Burk Act of the State and by the Secretary of Agriculture under the Federal Agricultural Marketing Agreement Act of 1937 are discussed. The first order of the Ohio Milk Marketing Commission for the Cincinnati area was issued in September 1933. The rules and regulations for the Toledo area were first approved March 16, 1934. The Burk Act expired July 1, 1935.

The evaporated milk industry under Federal marketing agreements, B. A. BAKER and R. K. FROKER (*Wisconsin Sta. Res. Bul. 156 (1945), pp. 91+, illus. 5*).—"In this publication, the possibilities are examined of increasing returns to producers for raw milk sold to evaporated milk plants by means of regulation. In addition, the operations of the two marketing agreements and the license under which the evaporated milk industry has been regulated since 1933 are examined in some detail with special reference to the extent to which producers have benefited, the effect on resale prices, the control of trade practices, and the general administration of the agreements. A number of suggestions are made for consideration in any future regulation of this type." The subject is discussed under the following headings: General considerations—presenting a general description of the industry and some of its economic characteristics; economic and legal bases for regulation; producer prices under regulation; regulation of manufacturers' selling prices; regulation of trade practices; and administration of the marketing agreements and license. The authors make the following conclusions and recommendations:

"A comparison of prices paid to producers with the minimum formula prices leads to the conclusion that this regulation has been ineffective in raising farmers' prices in three of the six producing sections of the nation and only partially effective for limited periods in the other three sections. Since 1940 the formula prices have been so low as to be wholly ineffective in all sections. These regulatory measures (Agreement No. 60 and License No. 100) contain several provisions of questionable public value, particularly as they relate to wholesale prices of evaporated milk, control of trade practices, and administration of the agreement and license. It is recommended that Agreement No. 60 and License No. 100 be terminated or that they be substantially changed to remove the questionable provisions and to make certain that they serve the primary purpose of bringing fair and equitable prices to producers. If this type of regulation is continued in the evaporated milk industry it is recommended: (1) That minimum producer price formulas be developed on the basis of the complete alternative use of milk for manufactured products and not solely or

mainly on the basis of the value of the fat for manufacture into butter; (2) that price adjustments in producer formulas for zones or sections reflect as closely as possible actual differences in assembling and handling costs of the raw milk and actual differences in manufacturing and transportation costs of evaporated milk; (3) that a formula for butterfat differentials be adopted which will more nearly reflect the value of both the fat and solids-not-fat content of the milk of different tests; (4) that the provisions in Agreement 60 and License 100 for filing manufacturers' prices for evaporated milk be either eliminated entirely or changed to remove the identity of the individual firm, and that market price information which is released be widely disseminated among wholesale purchasers as well as among manufacturers; (5) that the administration be vested in a person appointed by and directly responsible to the Secretary of Agriculture, since it is under his authority that this type of regulation is promulgated and since this arrangement would definitely place the responsibility for decisions and action and at the same time put all members of the industry on an equal basis relative to it; (6) that any producers' and manufacturers' committees serve on an advisory basis with no direct administrative power. This provision will not in any sense lessen the responsibility for initiating changes in the regulation and for developing evidence at public hearings which naturally falls upon producers and manufacturers; and (7) that producer cooperatives be developed in unorganized areas both for the purpose of performing marketing services which can properly be left with such groups and for the purpose of providing full producer representation at all hearings and negotiations. It is believed that this type of regulation can be of considerable value to the evaporated milk industry and to the public in making postwar adjustments as a result of a large expansion in production of evaporated milk (60 percent from 1939 to 1944), and from decreased domestic consumption due to wartime restrictions.

"Prices to producers at evaporated milk plants have been and are expected to continue to be very largely dependent on the value of the milk for alternative uses. Price regulation can nevertheless help producers obtain the full competitive value for their milk at all condenseries and assure them that they will not have to bear an undue share of the postwar price adjustments. It is doubtful, however, if this type of regulation can be relied upon to increase the over-all price to producers without resorting to rigid production and market control measures."

Collection of milk and cream from farms in Kentucky, C. D. PHILLIPS (*Kentucky Sta. Bul. 479 (1945), pp. 30, illus. 6*).—"This study is based on an analysis of the operation of 220 commercial routes collecting milk for use by fluid-milk distributors, 315 commercial routes collecting milk for use in manufactured products, 234 routes collecting cream from farms, and 78 routes collecting cream from cream-buying stations. These routes were located in all the producing areas of the State." The data on milk handled by distributors is analyzed to show the collection route mileage, number of patrons, size of load, and opportunities for savings. The section on collection of milk for manufacturing discusses the number of plants and volume of milk handled, collection conditions, types of trucks used, receipts and truck capacity, mileage and number of patrons, and opportunities for savings. The data on cream for manufacturing is handled in sections on cream-buying stations and farm pick-up cream routes.

"Milk and cream could be satisfactorily collected from farms with considerably fewer trucks operating fewer miles than in 1943 when this study was made. Fluid-milk routes could be reduced by at least 341,100 miles per year, factory-milk routes by some 239,000 miles, farm-cream routes by about 40,000 miles, and station-cream routes by 175,000 miles—and still furnish adequate farm-to-market transportation for each producer. This would be a reduction of 7.8 percent. Additional mileage could be saved if producers who delivered their own milk shipped it instead on an

established truck route which passed their farms; however, no record of the amount of this possible saving was made. Still more savings could be made, but changes to effect them would have interfered with operation of plants or were not practical because of the condition of roads."

Cotton ginning equipment and its utilization in South Carolina, J. M. STEPP (*South Carolina Sta. Bul. 362 (1945), pp. 43, illus. 11*).—"The specific objectives of the analysis described in this bulletin are as follows: (1) To ascertain recent trends in South Carolina with respect to cotton production, the number and size of cotton gins, the use of certain items of ginning equipment, and to discover what changes have occurred in South Carolina's relative position in those respects as compared with other cotton-producing States. (2) To analyze thoroughly the physical plant of South Carolina's active cotton ginning industry with respect to buildings; amount, type, and age of ginning machinery; kind of power used; the prevalence of certain items of auxiliary equipment; and total ginning capacity. (3) To investigate the relationships of the above-mentioned factors to each other and to the volume of ginning done by the individual gins. (4) To ascertain the seasonal operational patterns of the various gins and learn how they adjust themselves to seasonal changes in volume of business."

The study is based chiefly upon United States Census data and records for 148 gins which operated in 1940. These gins constituted 16.8 percent of the active gins in the State and were located in 10 selected counties so distributed as to be representative of the entire State.

Cotton quality statistics, United States, 1944-45. (Coop. Ariz., La., N. Mex., Okla., S. C., Tenn. Expt. Stas., et al.). (*U. S. Dept. Agr., Prod. and Market. Admin., 1945, CS-15, pp. 62+, illus. 5*).—A continuation, for the year 1944-45, of the series (E. S. R., 92, p. 722).

Cooperative frozen food locker associations in Illinois, 1945, P. C. WILKINS (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 94 (1946), pp. 34+, illus. 6*).—This report, made in cooperation with the St. Louis Bank for Cooperatives, is based on an analysis of the business of 25 associations operating in 25 counties throughout Illinois. The survey covers the respective fiscal years of the associations ending between August 31, 1944, and July 31, 1945. The analyses cover assets and sources of funds, financial ratios, investment in plant facilities, financial statements, incomes, expenses, savings, investments, processing volume, labor and management efficiency, and power consumption.

Crops and Markets [October 1945] (*U. S. Dept. Agr., Crops and Markets, 22 (1945), No. 4, pp. 153-192, illus. 1*).—Included are the usual crop, livestock, and marketing reports and data as to cotton supply, consumption, and exports, stocks of grain on farms, farm labor, fertilizer sales and utilization, prices received by farmers, farmers' share of consumer's food dollar, etc. A brief statement on net income of farm operators by States, 1944, includes tables showing by States the production expenses and realized net income of farm operators and the average realized net income per farm.

Index numbers of production, prices, and income, J. I. FALCONER (*Ohio Sta. Bimo. Bul. 237 (1945), p. 200*).—The table of index numbers is brought up through July 1945.

RURAL SOCIOLOGY

Agriculture in an unstable economy, T. W. SCHULTZ (*New York and London: McGraw-Hill Book Co., 1945, pp. 299+, illus. 23*).—This is a report on a fundamental study designed to get at the roots of the farm problem. Presented are prospective conditions affecting agriculture, fundamentals of the agricultural problem in an expanding and fluctuating economy, governmental programs and controls, and problems in agricultural policy.

Natural neighborhoods and communities of Wayne County, Tennessee, G. S. GALLIEN (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 193 (1946), pp. 24+, illus. 1*).—It was found that in this county little community life actually exists beyond the neighborhood in many cases. Future trends in farming will require more goods and service, as standards of living are increased. Of the 17 communities and 76 neighborhoods mapped, Waynesboro, Clifton, and Collinwood communities are fairly well organized, with each community having a small town as the center of the community. Lutts has less solidarity than any of the above communities, but has prospects of developing into a well-organized community. Second Creek, Topsy, and Fairview have possibilities of developing into definite communities. Many of the other communities lack the proper physical features or basis for growth. The communities have been arranged in the best groups possible for present conditions, but a 5-yr. program of road development, as is now being planned by the county highway department, would make possible a division into 10 communities rather than the present 17. It would also make possible a program of school consolidation whereby fewer schools could serve the students now served by 68 schools.

The farm business and farm family living as related to land class in nine Vermont towns, R. M. CARTER (*Vermont Sta. Bul. 526 (1945), pp. 36+, illus. 11*).—Dairy farmers made up nearly all the operators in land classes 1 and 2, about three-fourths of those in land class 3, and less than half of those in land class 4. Part-time farming was important only in the latter area. Farms in the better land classes were usually situated at lower elevations, closer to trading centers, and on better roads than were farms in land classes 3 and 4. Physical facilities for farming declined from land class to land class, with land class 1 farms superior in terms of average amount of tillable land, size and condition of barns, number of dairy cows, and quantity and condition of farm equipment. This same relationship was seen when the capital invested in each of these types of assets was examined; farmers in the better areas were utilizing much greater amounts of capital than were farmers in the poorer areas. Average farm receipts were \$3,216, \$2,266, \$1,762, and \$692 in land classes 1, 2, 3, and 4, respectively. Average farm expenses in the land classes, following the same order, were \$2,518, \$1,877, \$1,330, and \$892. There was little difference in the farm labor income of farmers in land classes 1, 2, and 3. When incomes from all sources are accumulated, farm families in land class 1 received about \$75 per month; in land classes 2 and 3, \$50 per month; and in land class 4, \$24 per month. While these amounts seem low in all areas, they appear especially inadequate in the fourth land class. Families in land classes 1, 2, and 3, despite their relatively low incomes, turned back an average of about \$150 into their farm businesses. The variation in average earnings of the operators in the four land classes who lacked ability was small, farmers earning \$365 in land class 1 as compared with \$226 in land class 4. For superior operators the variation was greater, with earnings ranging from \$2,335 in land class 1 to \$1,165 in land class 4. Land quality is thus of little importance, from the standpoint of earnings, to operators who are poor farmers. Farmers of average capacity, on the other hand, have slightly larger incomes when located in the better land classes than in the poorer.

The four land classes referred to are fully described in the appendix.

Keeping the farm in the family: A study of ownership processes in a low tenancy area of eastern Wisconsin, K. H. PARSONS and E. O. WAPLES (*Wisconsin Sta. Res. Bul. 157 (1945), pp. 53+*).—"In an area centering in Manitowoc and Kewaunee Counties, fewer than 10 percent of the farmers are renters and it has been this way since the country was first settled." This is an intensive study of an area of 12 sections (a strip 2 miles by 6 miles) within the larger area. Complete

ownership and debt history of all land in the 12 sections was compiled from public records, and the individual census schedules for 1860, 1870, and 1880 were consulted and analyzed. The operators of about 60 of the 84 homesteads in the 12 sections were visited, and each was invited to discuss: "(1) His success in acquiring a farm, including debt experience; (2) his occupational history both in farming and elsewhere; (3) the history of his family in the area; (4) the terms under which he had acquired the farm; (5) arrangements with parents and family if the operator was on a family farm; and (6) the educational program of the family, and similar questions." The data are analyzed and the findings summarized under the following headings: (1) General summary of ownership and debt experience; (2) transfer of farms as going concerns; (3) bonds of maintenance and income for parents; (4) parents' alternatives and help to their children in acquiring farms; (5) the alternatives of the children; and (6) inheritance and parental help.

Out of 57 farmers whose occupational and tenure histories were studied, only 8 were tenants at the time of the survey and less than one-fifth had ever been tenants. Most of the owners had acquired farms either from their parents or through help from parents. One of the most significant practices used in the area was that of transferring the farms as going concerns, i. e., with livestock, feed, and equipment as well as the land and buildings. Bonds of maintenance or support had been used on about one-fifth of the farms in the area. Under this practice parents frequently transfer their farm to one of the children, taking in part payment a contract for maintenance or support, and to secure the performance of these services usually take a mortgage on the farm. Thirty-two former owners transferred the home farm to one of their children (the present owner), while only 7 left farms to their children by inheritance. Eight other farms were bought by parents and transferred to their children, and 11 cases were found where the present owners received some help from parents in buying their farms.

Social factors of farm ownership in Oklahoma, R. T. McMILLAN and O. D. DUNCAN (*Oklahoma Sta. Bul.* 289 (1945), pp. 32, illus. 1).—This bulletin analyzes a large collection of factual data for the purpose of finding out what are the most important factors accelerating and hindering land ownership.

Individual initiative and effort are deemed the most important elements in the achievement of farm ownership at the present time. However, the study shows that farmers will need assistance at the hands of the public, particularly in the form of enlarged credit facilities, if farm ownership is to increase relatively in the future. The results are summarized as follows:

Fewer farmers born in the South than elsewhere achieve farm ownership in proportion to numbers. Farmers whose parents were landless only rarely become farm owners themselves. Farmers whose parents were landowners achieve farm ownership in far greater than expected proportions. Smaller proportions of children of nonowners than of owners of farms remain in agriculture. Farm classes are recruited almost exclusively from children of open-country families. The proportion of ownership tends to increase with age of farmers. Early marriage tends to limit the chances of farmers in achieving farm ownership, and the trend is toward earlier marriage in the open country. Farm owners tend to migrate less during their earning lives and to begin their careers at higher tenure levels than nonowners. Excepting cases in which income is derived from nonfarm sources, the proportion of farm ownership tends to increase with size of farm. Relatively, farm ownership tends to be greatest among livestock farmers and least among cotton farmers.

Social factors related to farm housing in southern Oklahoma, R. T. McMILLAN (*Oklahoma Sta. Tech. Bul.* 22 (1945), pp. 28, illus. 1).—In this study of the housing conditions previously described (E. S. R., 94, p. 554), it was found that the average housing index scores decrease in size for tenure groups as follows: Part owners,

full owners, tenants, and others. Families in southwestern Oklahoma score an average of 17.1 points and those in southeastern Oklahoma an average of 9.4 points on a scale with a maximum of 32 points. High fertility of families appears to be associated with poor housing and vice versa. Also, the average number of persons per family decreases as the housing scores increase. The housing scores tend to be related inversely to the age of dwelling. Husbands and wives in families with high housing scores participate more in organized community life than those with low scores. The number of illnesses per 1,000 persons for the previous year is 1,005 in southeastern Oklahoma and 226 in southwestern Oklahoma. Housing scores average higher for families who had not moved than for those who had moved during the last 10 yr. Three indexes of size of farm—productive man-work hours, total acreage per farm, and cultivated acreage per farm—tend to vary directly with size of housing scores excepting for the highest scored housing group. In southeastern Oklahoma, more than four-fifths of the families occupying farms with less than 100 acres or with no farm land at all rate low on the housing index. The housing on small general farms is inferior to the housing on livestock, large crop, and other farms. The difference in the average housing scores between farms with and those without tractors is as great as the difference in the scores of owner- and tenant-operated farms.

Rural people in the city: A study of the socio-economic status of 297 families in Lexington, Kentucky, H. W. BEERS and C. HEFLIN (*Kentucky Sta. Bul.* 478 (1945), pp. 19, illus. 1).—In this study of differences in behavior and characteristics of rural-reared and urban-reared people, as revealed in group data from 297 random-sample families, rural-reared people living in Lexington were, on the whole, found to be somewhat at a disadvantage—in some instances only very slightly, in others more severely so. Rural-rearing, on the average, was either a handicapping characteristic or it was associated with other disadvantaging factors. Rural-reared householders were found in all the income groups from lowest to highest, in all the neighborhoods, at all levels of education, in all types of occupation, and in all kinds of houses. Rural-reared householders shifted less from one rental class to another than urban-reared, but they moved from one residence to another in the same rental class, while in general the shifting of the urban-reared was to higher rental classes. The largest families were mainly among those of the rural-reared householders, and on the average there was less space per person in their houses.

Lack of training hinders farm production, S. C. MAYO (*Res. and Farming [North Carolina Sta.]*, 4 (1945), *Prog. Rpt.* 1, pp. 11–12, illus. 2).—In 1940, there were 143,563 functionally illiterate adult persons on the farms of North Carolina. This number is about half (51.1 percent) of the total functionally illiterates in the State. The author concluded that this large number of illiterates in the adult farm population makes it imperative that more careful preparation of education materials be provided by all persons and agencies in places of leadership. This was considered especially important in the translations of technical research into the life patterns of farm men and women. Chronological age should have little place in public school attendance laws, and the minimum attendance requirement for all mentally competent persons should be the completion of the total publicly maintained school system. Illiteracy must be eliminated not only for the good of the individuals concerned but for a more abundant life for all the people of North Carolina.

Farm women and the services of a farmers' cooperative: A study of the relationship of farm women to the Cooperative Grange League Federation Exchange, Incorporated, or GLF, W. A. ANDERSON ([*New York*] *Cornell Sta. Mimeog. Bul.* 17 (1945), pp. 34+).—Because of the few direct contacts these farm women have with their Grange League Federation cooperative, their knowledge about the organization is limited. Few know accurately how membership is attained

in the organization, and most of them have no knowledge of how their local unit, to say nothing of the central GLF, is operated. For knowledge about the organization, the husband or a family member is a chief reliance but apparently these give little information. The opinions they have of GLF policies and practices are, of course, based on their knowledge of and experiences with the organization. They praise GLF goods and services, especially because of quality, price, and convenience.

Earlier studies have been noted (E. S. R., 93, p. 508).

Illness in rural Missouri, H. F. KAUFMAN and W. W. MORSE (*Missouri Sta. Res. Bul.* 391 (1945), pp. 55, illus. 4).—The survey covered the experience of 1,544 open-country households, approximately 10 percent of the rural-farm population in Lewis, Ray, Franklin, Dallas, and New Madrid Counties. On the last day of the survey year, 17 percent of the 6,017 persons included in the survey were ill. Eleven percent of all persons were suffering from illnesses of 1 yr. or longer, and 6 percent from shorter ailments. During the survey year, 44 percent of all persons included were ill one or more days. Localities that were agriculturally poor and relatively isolated from medical and health services, on the whole, showed higher illness rates. Persons 60 yr. of age and over had illness rates of 133,849 days a year as compared with 20,187 days for those under 15. This relatively high illness rate for older persons has implications for farm labor and management, especially in a period of labor shortage. The rate of illness for farm operators was 67,800 days yearly per 1,000 operators. The average age of the farm operators in the survey was slightly over 50 yr.—an average similar to that for all farm operators in the State. Forty-four percent of the farm operators were ill one or more days during the year.

Planning the rural hospital and health center, B. W. BIRD and P. H. LANDIS (*Washington Sta. Pop. Bul.* 181 (1945), pp. 16, illus. 2).—Topics discussed include the need of a State-wide hospital system; the health center for small places; the community hospital for rural areas, including the site, cost, and buildings, financing the construction, organization and administration, and operating budget; organizing the community for prepaid hospital care; and a typical association for such care. A bibliography is included.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Federal legislation, regulations, and rulings affecting cooperative extension work in agriculture and home economics (*U. S. Dept. Agr., Misc. Pub.* 285 (1946), rev., pp. 61).—This is a revision of the 1937 revision (E. S. R., 78, p. 274).

FOODS—HUMAN NUTRITION

Complex carbohydrates of some Chinese foods, L. C. KUNG (*Jour. Nutr.*, 28 (1944), No. 6, pp. 407-411).—The crude fiber content of 17 foods common in the diets of the Chinese has been determined. Lignin, cellulose, and hemicellulose have been assayed on both a wet and dry basis, as well as the protein, fat, and ash. The foods studied included rape, cabbage (2 varieties), mustard, leeks, coriander, turnips, mung bean sprouts, pea pods, rice, millet, and soybeans, as well as lesser known Chinese foods. The total fiber content of these foods ranged from 0.4 to 1.8 percent wet weight, or 8.5 to 19.2 percent dry weight.

Ratio of soluble sugars, pectic materials, and hemicelluloses to nitrogen-free extract of some common vegetables, E. BENNETT. (Mass. Expt. Sta.). (*Food Res.*, 9 (1944), No. 6, pp. 462-464).—Studies were made on asparagus, cabbage, carrot, celery, dandelion, eggplant, head lettuce, kale, peppers, radish, spinach, string beans, squash, and turnip. The results were quite variable—soluble sugars ranging from 4 percent (dry matter) in spinach to 51 percent in carrot and representing, respectively, 12 to 60 percent of the nitrogen-free extract. Pectic materials and

hemicelluloses, taken together, gave values ranging from 5 percent dry matter in asparagus to 19 percent in eggplant, representing approximately from 11 to 52 percent of the nitrogen-free extract. The author concludes that "from the above data it is evident that the amount of soluble sugars, pectic compounds, and hemicelluloses varies with the species, and that the numerical value of the nitrogen-free extract gives little information regarding the relative amounts of these fractions."

Foods with future from yams. (Ala. Polytech. Inst.). (*Food Indus.*, 16 (1944), No. 12, pp. 75, 146, illus. 1).—A number of products made from Alabama yams, prepared for ready serving, are now being distributed for use. These include breakfast cereals similar to prepared cereals; natural taffies and combinations with pecans, peanuts, orange peel, and coconut; candies; specialty products; and a malt powder. The manufacture of these products involves washing and baking, peeling, pulping of the sweetpotatoes, followed by mixing, extruding, toasting, and packaging. Plans were being made for using the Alayam (Alabama yam) products as a staple food.

Improving the quality of peanut butter. J. G. WOODROOF, H. H. THOMPSON, and S. R. CECIL (*Georgia Sta. Bul.* 243 (1945), pp. 20, illus. 5).—Methods are described for flavoring, firming, blocking, wrapping, and storing a new type of peanut butter. Approximately 40 flavoring materials were added to peanut butter to determine the combinations which would modify its natural flavor and thus increase its utilization (formulas given), and acceptable combinations were made with malted milk, cocoa, raisins, and other natural and synthetic flavors. Suggestions given for preventing oil separation in peanut butter are: (1) Keeping it cooled to 50° F. or lower (at this temperature the oil is viscous and does not separate, the development of rancidity is reduced, and insect infestation is practically eliminated); (2) adding 1 to 3 percent hard fat or hydrogenated oil as the peanuts are ground into butter; (3) adding something to absorb oil such as ground raw peanuts, 15 to 25 percent sucrose, dextrose, dried milk, raisins, oat flour, defatted soya flour, starch, or malted milk; and (4) inverting the jars while in storage. The oil-absorbent materials were found to reduce stickiness and firm the peanut butter for molding, wrapping, and slicing. Pliofilm, laminated foil, or specially coated cellophane or parchment were satisfactory for packaging when prefabricated bags or sheets were used. Formulas are given for peanut butter spreads.

Selection of varieties of fruits and vegetables particularly high in nutritive value (*New York State Sta. Rpt.* 1945, p. 25).—Determinations of ascorbic acid in 94 apple varieties, including 33 seedlings and 61 named varieties, gave values ranging from less than 2 to 40 mg./100 gm. of apple. Of the 94 varieties tested, only 8 had ascorbic acid values above 15 mg. This group included Calville Blanc with the high average value of 37 mg./100 gm.; 5 seedlings, 3 of which averaged 24, 22, and 19 mg./100 gm., respectively; and the varieties Yellow Newtown and Twenty Ounce. Sixteen varieties ranged between 10 and 15 mg. This group included Jonathan, Golden Delicious, Northwest Greening, Red Rome, Red Spy, and Deacon Jones. Twenty-four varieties ranged between 5 and 10 mg. and included Winesap, Cortland, Rhode Island Greening, and Boiken. Varieties having less than 5 mg. included McIntosh, Macoun, and Davenport.

Fruits of Hawaii. C. D. MILLER and K. BAZORE (*Hawaii Sta. Bul.* 96 (1945), pp. 129, illus. 21).—This is a popular and revised edition of Bulletin 77 (E. S. R., 75, p. 879), which has been enlarged to provide information on five new fruits: Carissa, ketambilla, mulberry, Java plum, and roselle. Additional recipes and general directions for canning and preserving have been included. Recent data are presented on the ascorbic acid, thiamine, and vitamin A content of the fruits described. Criteria for evaluating the fruits as sources of minerals and vitamins are listed in the appendixes.

Dried, syrup treated fruit, W. V. CRUESS, H. F. FRIAR, and P. VAN HOLTEN. (Univ. Calif. et al.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 24 (1945), No. 8, pp. 241-242, 247).—Procedures for steaming, then impregnating cherries, apricots, peaches, pears, Kadota figs, and pineapple with sirup before dehydrating to 20-24 percent moisture for good keeping quality, are described.

Studies on the bacteriology of stored, dried egg powder, S. E. HARTSELL. (Ind. Expt. Sta. et al.). (*Food Res.*, 9 (1944), No. 6, pp. 505-511).—Samples from a single batch of spray-dried, whole-egg powder were stored at 0°, 10°, 20°, and 37° C. for a period of 3 mo. Loose-packed and compressed samples were packaged in greaseproof cartons or greaseproof cartons with carbon liners, and the loose-packed samples were also stored in tin cans.

Bacterial examinations after 1, 2, and 3 months' storage were made on standard methods media and on yeast-water agar. The plates were incubated at 32° and 37°.

"The data indicate that as the storage temperature of spray-dried, whole-egg powder is increased, the total bacterial count is decreased with time. Yeast-water (one part) added to the glucose-tryptone agar (nine parts), recommended in Standard Methods for the Examination of Dairy Products, is a desirable medium for determining the total bacterial counts of stored, spray-dried, whole-egg powder. The bacteria found most frequently in stored egg powder belong to the genus *Bacillus*. Their presence, however, may not be detected unless suitable plating media are employed. An incubation temperature of 32° gives much higher total bacterial counts and more successful isolations from stored, spray-dried, whole-egg powder than 37°. Compression of spray-dried, whole-egg powder may reduce the total bacterial count slightly but has no noticeable influence on the genera surviving in the stored samples. The types of packages employed in this study did not influence the bacterial flora of the stored samples."

Cellular changes in certain fruits and vegetables during blanching and dehydration, A. S. CRAFTS. (Univ. Calif.). (*Food Res.*, 9 (1944), No. 6, pp. 442-452, illus. 20).—Elaborating upon his previous studies (E. S. R., 92, p. 437), the author has extended his experiments to include several fruits (apricot, pear, peach, apple, and prune) and vegetables (potato, cabbage, carrot, and sweetpotato). Histological sections were treated so as to approximate normal conditions of steam blanching and drying, and photomicrographs of the results are presented. With the exception of prunes and white potatoes, steam blanching is recommended in the drying of the other fruits and vegetables studies. By its action in softening the cell walls, steam blanching removes most of the intercellular air and dries tissues down to a bright translucent product. The author concludes that "intercellular air restricts the free movement of moisture and heat through the tissue and hinders dehydration. Oxygen in the intercellular air in tissues may react with vitamins and other labile materials, lowering the quality of the product during storage. Freedom from intercellular air may serve as an index of thorough blanching. Thus translucency of the tissue is a rapid, indirect measure of the inactivation of enzymes and softening of the cell walls."

Beet-blanching methods evaluated, H. S. MADSEN, E. LITWILLER, and E. H. WIEGAND. (Oreg. State Col.). (*Food Indus.*, 16 (1944), No. 12, pp. 86, 146-147).—A series of experiments was conducted on time and temperature factors involved in the heat inactivation of the peroxidase enzyme. Findings indicated that steam blanching of diced beets required too long a time for commercial practice and largely removed the color of the beets; pressure cooking of whole beets at 240° F. for a length of time sufficient for inactivation of peroxidase in the center of the beets overcooked the outer portion; retorting whole beets, plus a short steam blanch, produced a negative benzidine reaction; and pressure cooking of the beets cut for dehydration (strips or diced) allowed for economical control as well as

inactivation of the peroxidase enzyme. It appeared from the experiments that a thermostable substance or substances which catalyzed the H_2O_2 -benzidine reaction was present in the beets.

Severe blanch doesn't improve dehydrated potato quality, H. CAMPBELL, H. LINEWEAVER, and H. J. MORRIS. (U. S. D. A.). (*Food Indus.*, 17 (1945), No. 4, pp. 92-94, 186-194, illus. 1).—In the study reported, U. S. No. 1 Russet Burbank potatoes were mixed and divided into six lots, peeled, trimmed, and cut into $\frac{3}{8}$ -in. cubes. Following blanching (1, 2, 3, 4, 7, and 10 min.), the potatoes were washed and dehydrated; moisture determinations were made, and the edible quality was evaluated.

The effects of blanching and storage on peroxidase activity are shown. "From the results of this study, it has been concluded that storage quality of dehydrated white potatoes is not improved by severe blanching or by completely inactivating the peroxidase enzyme system. The presence of residual peroxidase in the dehydrated product, even to the extent found in the potatoes blanched for the shortest time, is of little moment. Potatoes blanched for 10 min. had no better keeping quality than potatoes blanched for 1 or 2 min.

"This does not mean, however, that potatoes to be dehydrated do not need to be blanched, but rather that it is safe to reduce the extent of blanching. It must be remembered that the efficiency of blanching equipment varies and therefore the time required to effect equivalent amounts of blanching will vary.

"Below 70° F., temperature does not markedly affect rate of quality deterioration of dehydrated potatoes during storage. A storage temperature as high as 90° for long periods of time is undesirable, especially from the standpoint of color change.

"The most marked effect of storage at 90° was on color. The formation of water-soluble pigment appeared to be related to moisture content, thus suggesting that when dehydrated potatoes are to be stored at temperatures high than 70°, the moisture content should be somewhat below the present specification level of 7 percent.

"The problem of overblanching is associated with characteristics of the raw material. Some lots of potatoes are more subject to overblanching or the so-called 'popcorn' effect than others. From the work of Freeman, the popcorn effect appears to be related to the degree of mealiness in the raw stock. The higher the degree of mealiness, the higher was the degree of popcorn effect. If the relation between mealiness and the popcorn effect is a true one, and there is no reason to doubt it at present, then exceptionally mealy potatoes are not suitable for dehydration purposes."

Effect of storage temperatures on sensitivity of White Rose potatoes to processing heat, H. CAMPBELL and P. W. KILPATRICK. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), No. 4, pp. 106-108, 120-121, illus. 1).—Experimental work on White Rose potatoes was made to determine the effect of 70°-75°, 40°, and 32° F. storage temperatures of 2, 4, 6, and 8 weeks' duration on the degree of heat damage in dehydrated potatoes. At the end of the 8-week period, the potatoes remaining in the 40° and 32° storage were transferred to storage at 70°-75° for 1, 2, and 4 weeks of additional storage before the samples were prepared and dehydrated by the two-stage and single-stage systems. Prior to blanching determinations of moisture, total sugar, and reducing sugar were made. Following dehydration, samples were taken to ascertain moisture and heat damage (determined by count and photocolometric measurement of light absorbed in clarified water).

Results showed that heat damage appearing in normally dehydrated potatoes was due in part to storage of raw stock where temperatures permitted an accumulation of sugars. Although the rate of total sugar accumulation was greater at 32° than at 40°, the rate of reducing sugar was greater at 40°. This led the workers to believe that heat damage during dehydration is more closely related to the amount

of reducing sugar than to that of the total sugar in the potato. The sensitivity of potatoes to heat damage resulting from low temperatures was reduced by elevating the storage temperatures from 32° and 40° to 70°–75° prior to storage. The authors conclude that reducing sugar determinations may be used as an index to heat damage; available data indicate that a limit of 2.5 to 30 percent maximum reducing sugars (on a moisture-free basis) should not be exceeded for such control.

Food value of brined vegetables, I. D. JONES and J. L. ETCHHELLS. (Coop. U. S. D. A.). (*Res. and Farming* [North Carolina Sta.], 4 (1945), *Prog. Rpt. 1*, pp. 1–2, 12, illus. 3).—Essentially reported elsewhere (E. S. R., 94, p. 682).

Preservation of foods on the farm by freezing, G. M. REDFIELD and R. L. WITZ (*Indiana Sta. Bul. 507* (1945), pp. 15–, illus. 6).—The work reported here compares as to desirability of home-grown fruits, vegetables, and meats frozen in a locker plant with those frozen in farm freezing units. Analyses of the scores based on appearance, odor, flavor, color, and texture of the foods showed that of the three freezer units and the locker plants studied, the frozen products were equally satisfactory in quality and up to 1 mo. of storage did not deteriorate. Frozen food units which maintain a temperature of 5° F. or lower and which are equipped with facilities for rapid freezing were as satisfactory as the locker plant for maintaining quality. Practices recommended for preserving the fruits included a dry sugar pack of one part of sugar to three, four, or five parts of fruit; for freezing vegetables, the recommendations included blanching the product 2 to 3 min. in boiling water, cooling, and packing either dry or in 2 percent brine.

A survey of locker plant users indicated that many of the refrigerators now in use do not have a sufficiently large freezing compartment to meet the housewife's weekly needs for frozen foods. "The number of cubic feet needed at any one time for storing frozen foods may be estimated at about three-fourths of the number of pounds of meat plus the number of pints of fruits and vegetables preserved in 1 yr." Records kept over a period of a year showed an average energy consumption of 4.67 kw.-hr. per cubic foot per month. At 3 ct. per kilowatt-hour, a 24-cu.-ft. unit (adequate for a family of four) would have an average monthly operation cost of \$3.36.

The freeze-drying of foods—a look into the future, J. C. MOYER and E. STOTZ. (N. Y. State Expt. Sta.). (*Farm Res.* [New York State and Cornell Stas.], 12 (1946), No. 1, pp. 16–17, illus. 1).—The method of preserving described here, still in the experimental stage, received attention during the war due to employing its use in reducing large quantities of blood plasma and penicillin to a stable form for shipment. Fruits and vegetables dehydrated by this method retain their flavor and much of their original color.

Frozen foods increasingly popular with consumer, N. K. MASTERMAN. (Cornell Univ.). (*Farm Res.* [New York State and Cornell Stas.], 12 (1946), No. 1, pp. 4–5).—This is a review of the advantages of frozen foods prepared in home or community storage lockers. Similar material is noted elsewhere (E. S. R., 94, p. 537).

Food habits of families in the eastern health district of Baltimore in the winter and spring of 1943, J. DOWNES and A. BARANOVSKY (*Milbank Mem. Fund Quart.*, 22 (1944), No. 2, pp. 161–192, illus. 5).—"Comparison of the use of various types of foods by the same families at two different periods indicated that use of specific foods varied greatly, although there was some relationship between the levels of use in the two periods. It was concluded that a food record of a family for any particular period cannot be considered as typical of the food habits of the family.

"Apparently, food rationing did not materially alter the food habits."

Nutritive value of food served in some large naval messes, C. M. McCAY, M. B. PINE, F. H. DAVIS, R. A. GORTNER, G. E. HAUGEN, J. H. SULLIVAN, L. J.

BERNATOWICZ, and B. L. HUDSON (*Jour. Amer. Dietet. Assoc.*, 21 (1945), No. 2, pp. 88-91).—Proximate, mineral, and vitamin analyses were made of representative composite samples of the food served to naval personnel (men and women). The samples, equivalent to one-half of an average meal, were combined in a Waring blender, slurried, made up to a given volume with water, poured into a cellophane bag, and frozen. A. O. A. C. analytical procedures were used in most assays. Separate samples for ascorbic acid analysis were made up with trichloroacetic acid and activated charcoal, aliquots being preserved with thiourea and frozen, and assayed by the method of Roe and Kuether (*E. S. R.*, 90, p. 297).

Estimates based on samples of food waste and on food supplements obtained from the Ship's Service store were included in the calculations of dietary intake. Comparisons were made of the values obtained analytically, with values calculated from nutrition tables by the usual long method and by the short method of Berryman and Chatfield (*E. S. R.*, 90, p. 558). A typical week's menu is presented.

The results indicated that a nutritionally adequate diet of approximately 3,400 calories for the men and about 2,400 calories for the women was provided. About one-eighth of the food served to the men was rejected as plate waste, but a calorically equivalent amount was bought outside the mess. Much of the plate waste was fat, while the food purchased was high in sugar.

Analysis of fruits and vegetables issued from a large naval supply base showed the following 11 items provided about 90 percent of these foods consumed: Potatoes 47.3 percent, cabbage 5.5, onions 4.9, lettuce 4.6, carrots 3.1, celery 3.0, tomatoes 2.8, sweetpotatoes 1.6, oranges 8.5, apples 7.0, and grapefruit 2.3 percent.

Methods are indicated for improving the diet by modifications in menus and in cooking procedures or by changes in the composition of the food supplements such as candy and soft drinks.

The nutritive value of naval food, C. M. McCAY, F. H. DAVIS, R. A. GORTNER, JR., G. E. HAUGEN, and J. H. SULLIVAN (*U. S. Naval Med. Bul.*, 45 (1945), No. 5, pp. 903-909).—Assays were made to determine the nutritive value of the food consumed by naval personnel (recruits and nurses). Representative average portions were taken, blended into a slurry, frozen, and held at low temperature until analyzed. Estimates of plate waste (mainly bread and fat) and of food consumed outside of the mess (soft drinks, nuts, ice cream, and candy) were also considered in the final calculations. Actual assay values are tabulated and compared with values obtained from food composition tables.

The results showed that the total calories obtained from the messes averaged 2,620 for the men and 2,044 for the nurses. Extra food and beverages, amounting to nearly 600 calories, were found to be consumed by the recruits. The proximate, mineral, and vitamin assays indicated that recommended nutritional allowances could be supplied readily by the food consumed.

Greatest discrepancies between estimated and observed values occurred in the cases of total calories and of fat, and were due primarily to plate waste and meat trimming losses. Plate waste, unless controlled, could run as high as 20 percent.

Suggestions given for improving palatability and nutritive value of the food included cooking for shorter periods of time, holding for shorter periods before service, use of more cooking water in foods, and increased use of giblets or similar edible items by proper preparation and cooking.

Food intake of college women, [I, II], M. L. GREENWOOD and B. N. LONSINGER. (Okla. A. and M. Col.). (*Jour. Amer. Dietet. Assoc.*, 20 (1944), Nos. 8, pp. 524-527; 10, pp. 671-675).

[I]. *Caloric intake and energy requirement.*—One-week food records of 203 college women served as a basis for the results and conclusions which were derived from available food composition tables. The data, covering a period of three regular

semesters and two summer sessions of the years 1941-42, have been tabulated and analyzed statistically. Weight and height data, recorded for 132 subjects, averaged 58.4 kg. and 164.07 cm., respectively.

The mean caloric intake was found to be 2,015.9 calories with a range of 1,089 to 3,082 calories. The caloric requirement, calculated from activity records and expected body weight, averaged 2,284.7 calories. The authors suggest from these figures that college women should be regarded as a sedentary rather than a moderately active group. From the mean height and weight figures observed, which were average or above average, the inference is drawn that the caloric intake was adequate, and that the present recommended standard for calories is somewhat high.

Classification of the women by groups indicated that the students who ate at home or did light housekeeping consumed less calories than those who ate in residence halls, sororities, cafeterias, and restaurants.

[II]. *Protein, calcium, phosphorus, and iron.*—Estimates of the protein intake showed a mean value of 64.6 gm. per day, or an average intake of 1.112 grams per kilogram body weight. The maximum, minimum, and mean were, respectively, 1.551, 0.350, and 0.8288 gm. for calcium; 1.757, 0.660, and 1.1713 gm. for phosphorus; and 16.36, 5.81 and 10.335 mg. for iron. The data are tabulated, and other investigations in the same field are discussed.

Certain interrelationships have been suggested and simple and partial correlations established. The authors indicate that calcium can be estimated with reasonable accuracy from phosphorus determinations alone. Positive correlations also occurred between protein and phosphorus, calories and iron, and phosphorus and iron. A negative partial correlation existed between calcium and iron. Low or high calcium intakes varied directly with milk consumption.

The protein intake and the mean level of calcium were considered adequate; the phosphorus intake was higher than that considered necessary for nitrogen equilibrium; and the iron level was significantly below the accepted standard of 12 mg. The authors suggest that the standard may be too high, as unpublished data on the hemoglobin levels of the subjects indicated adequate iron intake.

Dinner foods, D. DICKINS (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), No. 12, pp. 1, 5).—Types of foods 80 white and 80 Negro families served at dinner during one week are noted here. Boiled cowpeas, boiled lima beans, potatoes, sliced tomatoes, corn, cornbread, biscuits, and iced tea were served by the majority of the four different income groups studied (41 white families in the housing group of \$20.00 per month and under; 39 white families with housing from \$20.01 to \$40.00; 39 Negro families with housing at \$7.50 and under; and 41 Negro families with housing from \$7.51 to \$20). Dinner patterns for the 160 families sometimes included milk, desserts, meats, and salads.

Medical evaluation of nutritional status, XIV-XVI (*Milbank Mem. Fund Quart.*, 21 (1943), No. 4, pp. 311-343, illus. 5; 22 (1944), No. 1, pp. 5-40, illus. 4; 23 (1945), No. 4, pp. 353-385, illus. 4).—These studies are in continuation of a series previously noted (E. S. R., 88, p. 547).

XIV. *Neuromuscular response to galvanic current as a guide to the adequacy of the calcium nutrition of adolescents*, G. W. Beebe.—Indirect assessment of calcium nutrition based on calculated calcium intake, serum calcium, and relative skeletal maturity was made on approximately 1,800 adolescents. No significant relationship could be found between the neuromuscular response to galvanic stimulation and any of the three indicators of calcium nutrition.

XV. *Caloric intake of high school students in New York City*, D. G. Wiehl.—Diet histories and records of daily activity were analyzed for 300 pupils in a private high school and 2,000 pupils in a public high school. The limitations and possible errors of the data are discussed. The results showed that the caloric intake of pupils

in the private school approximately equalled the estimated caloric need; obesity was rather prevalent, and an inverse relationship between intake and need was apparent. The public school pupils, all from low income families, had a significantly lower caloric percentage (intake in terms of caloric need). The caloric percentage values for Jewish, Italian, and "others" were calculated respectively as 82, 91, and 93 for boys and 86, 98, and 97 for girls.

XVI. *Essential nutrients in diets of high school students according to sex and age and for different cultural groups in New York City*, D. G. Wiehl and K. Berry.—The diets of the high school children studied in part XV were analyzed from food consumption records for protein, calcium, iron, vitamin A, and ascorbic acid. In general, the average intake of private school pupils exceeded the recommended daily allowance. Public school pupils had lower average amounts of all nutrients. In relation to allowances, calcium and ascorbic acid were the principal deficiencies for the boys and calcium and iron for the girls.

Hemoglobin concentration and erythrocyte counts of the blood of college men and women, O. SHEETS and M. W. BARRENTINE. (Miss. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 8, pp. 521–523, illus. 4).—This investigation was undertaken to study the incidence of anemia among normal college students by determinations of hemoglobin concentration and erythrocyte count.

The maximum, minimum, and mean hemoglobin values for 684 men examined were 18.3, 9.8, and 14.6 mg./100 cc. blood, respectively; and for 604 women examined 15.7, 8.8, and 12.4 gm., respectively.

The maximum, minimum, and mean erythrocyte counts were 6.465, 3.870, and 5.176 million cells per cubic millimeter for the men; and 5.455, 3.740, and 4.658 million cells per cubic millimeter for the women, respectively. While the mean erythrocyte counts for both sexes were comparable to those found for normal subjects by other investigators, the average hemoglobin values ran somewhat lower than other reported values.

With the arbitrary selection of 13.0 gm. for men and 11.5 gm. for women as normal minimum hemoglobin values, the authors concluded that a mild degree of anemia exists among a significant number of subjects. Over 20 percent of both men and women had minimum values, or values 0.9 gm. or less above minimum. The normal red cell count found with this moderately low hemoglobin value (resulting in a low color index) suggested that the anemia was associated with undernutrition.

An attempt was made to correlate low hemoglobin values, indicative of anemia, with weight (underweight being considered indicative of undernutrition). No positive correlation could be found.

Adaptation to undernutrition, H. H. MITCHELL. (Univ. Ill.). (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 8, pp. 511–515).—In this general review, the author discusses the observations of over 30 investigators who have shown, in varying degrees, that the ability to adapt oneself to suboptimal amounts of essential nutrients is inherent in animal and man. This definition of nutritional adaptation is suggested: "If an animal in equilibrium with its food supply (meaning a well-nourished animal) is subjected to nutritional stress such as an inadequate (or an excessive) supply of one or more essential nutrients, the animal will react in such a way as to minimize, as far as possible, or to undo entirely the effects of the nutritional stress."

Metabolic acclimatization to tropical heat, C. A. MILLS (*Amer. Jour. Trop. Med.*, 25 (1945), No. 1, pp. 59–61).—A review of material essentially reported elsewhere (E. S. R., 93, p. 651); 15 references are included.

The utilization of iron from different foods by normal young rats, O. F. PYE (*Diss., Columbia Univ., New York, 1944, pp. 26+*, illus. 3).—Anemia-producing basal diets fed to 21- to 24-day-old rats were supplemented with the following dried foods:

Beef liver, beef muscle, egg yolk, cooked or raw kale, cooked or raw spinach, or whole-wheat flour. The supplements were measured so as to provide the equivalent of 0.0020 mg. per gram of body weight per day. Negative controls, as well as positive controls fed ferric chloride, also were included. Rats receiving supplements low in copper (egg yolk and ferric chloride) were given an additional supplement of copper sulfate. A second series of tests was made in which the level of iron fed was variable. A basal diet containing one-third dried whole milk was supplemented as follows: (I), Two-thirds whole-wheat flour; (II), one-third whole-wheat plus one-third patent flour; (III), two-thirds unenriched patent flour; and (IV), same as III, with added iron. Additional minerals (other than iron) and vitamins to compensate for that lost in milling were added in diets II, III, and IV. The iron content of the four diets was calculated to be 2.63, 1.88, 0.97, and 2.54 mg./100 gm., respectively.

Iron utilization was calculated by measuring hemoglobin values at weekly intervals over a 6-week period, and determining the iron stored in the rat body by carcass analysis made at the end of the feeding period.

Results indicated that where equivalent amounts of iron per gram body weight were fed, the best retention was obtained with ferric chloride, whole-wheat flour, and beef liver—all showing average values of 42 percent. In the other foods tested, the iron seemed less available, but the relative differences were small—retention ranging from 26 to 32 percent.

In the second series of experiments, retention of iron was good (46 to 54 percent) whereas hemoglobin values varied directly with the iron intake, being 14.7, 11.5, 6.6, and 13.9, respectively, for the four diets.

With a readily available source of iron, a minimum level of 0.002 mg. of iron per gram of body weight per day is recommended for adequate hemoglobin production and iron storage.

Vitamins and hormones, II, III, edited by R. S. HARRIS and K. V. THIMANN (*New York: Academic Press, 1944, vol. 2, pp. 514+*, illus. 55; 1945, vol. 3, pp. 420+, illus. 15).—The second volume of this series (E. S. R., 90, p. 562) contains 11 reviews of which the following are of nutritional significance: The Role of Vitamins in the Anabolism of Fats, by E. W. McHenry and M. L. Cornett (pp. 1-27); The Chemistry of Biotin, by D. B. Melville (pp. 29-69); The Nutritional Requirements of Primates Other than Man, by P. L. Day (pp. 71-105); Physiological Action of Vitamin E and Its Homologues, by K. E. Mason (pp. 107-153); The Chemistry and Physiology of Vitamin A, by I. M. Heilbron, W. E. Jones, and A. L. Bacharach (pp. 155-213); Para-Aminobenzoic Acid—Experimental and Clinical Studies, by S. Ansbacher (pp. 215-254); and A Critique of the Etiology of Dental Caries, by G. J. Cox (pp. 255-304).

The third volume contains nine articles of which the following are of nutritional importance: The Interrelation of Vitamins, by T. Moore (pp. 1-21); The Synthesis of B Vitamins by Intestinal Bacteria, by V. A. Najjar and R. Barrett (pp. 23-48); Sulfonamides and Vitamin Deficiencies, by F. S. Daft and W. H. Sebrell (pp. 59-72); Manifestations of Prenatal Nutritional Deficiency, by J. Warkany (pp. 73-103); Growth Factors in Microbiology—Some Wider Aspects of Nutritional Studies with Micro-organisms, by B. C. J. G. Knight (pp. 105-228b); and Chemistry of Anti-Pernicious Anemia Substances of Liver, by Y. Subbarow, A. B. Hastings, and M. Eldin (pp. 237-296).

Vitamins in spray-dried eggs, E. M. CRUICKSHANK, E. KODICEK, and Y. L. WANG (*Jour. Soc. Chem. Indus., Trans. and Commun., 64 (1945), No. 1, pp. 15-17*).—Fresh egg pulp and spray-dried egg powders were assayed for vitamins A and D, thiamine, riboflavin, and nicotinic acid. Vitamin D was estimated by the curative method using rat tibiae. All the other vitamins were assayed by fluorimetric pro-

The following results were noted: "Little or no loss of vitamin A or vitamin D could be detected on drying, but the vitamin B₁ dropped by about 30 percent. There appeared to be no loss of vitamin A and D during storage of the egg powders in a nitrogen gas pack at 15° C. for 5 mo. Vitamin B₁ remained stable under these conditions for a period of 12 mo. When egg powders of relatively high water content were stored in air at 37°, almost all the vitamin B₁ disappeared. The same samples stored at -20° had a vitamin B₁ content similar to that of the average of all the egg powders examined. This indicates that it is the high temperature rather than high moisture content which detrimentally affects the retention of vitamin B₁. The riboflavin content of the egg powders of high water content was not reduced by storage at high temperatures."

Ascorbic acid, thiamin, riboflavin, and carotene contents of asparagus and spinach in the fresh, stored, and frozen states, both before and after cooking, E. G. GLEIM, D. K. TRESSLER and F. FENTON. (N. Y. State Expt. Sta. coop. Cornell Univ.). (*Food Res.*, 9 (1944), No. 6, pp. 471-490)—A study was made of the effects upon the vitamin content of asparagus and spinach under the following conditions: (I) Storage at room temperature for 24 hr.; (II) storage at 0° to 4.4° C. for 7 days; (III) commercial quick freezing and storage at -40°; (IV) cooking the fresh and stored samples in a large volume of water in an open pan (300 gm. vegetable in 600 or 1,200 gm. water); and (V) cooking same in a small amount of water (60 gm. of water) in a covered pan. The results are tabulated and a detailed description is given of the procedures used.

The fresh asparagus and spinach were found to contain, per 100 gm., respectively, the following amounts of vitamins: Ascorbic acid, 43.2 and 29.8 mg.; thiamine, 0.187 and 0.087 mg.; riboflavin, 0.318 and 0.213 mg.; and carotene, 0.432 and 4.063 mg.

Results with asparagus indicated highest retention of all vitamins, with the exception of ascorbic acid, in I. Losses of thiamine and carotene were small (under 15 percent) in I and II and approximately double in III. Best ascorbic acid retention occurred in III.

Spinach, in general, showed progressively greater losses of all vitamins in II and III than in I—loss of ascorbic acid amounting to 63 percent in III. Carotene losses for both vegetables were small under all storage conditions and remained practically unaffected by the two methods of cooking. With fresh asparagus, cooking by method V produced from 7 to 13 percent greater retention than IV. In fresh spinach, an even greater effect was noted—24, 50, and 52 percent retention of ascorbic acid, thiamine, and riboflavin in IV v. 62, 73, and 75 percent retention in V. Similar results were noted with the stored samples I, II, and III. Large amounts of water (IV) caused greater solution of the three water-soluble vitamins, and greater destruction of ascorbic acid and riboflavin. Fifty-eight references are listed.

The relative effect of variety and environment in determining the variations of per cent dry weight, ascorbic acid, and carotene content of cabbage and beans, B. E. JAMES. (Univ. Fla.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 387-390).—Two varieties of cabbage, Early Jersey Wakefield and Copenhagen Market, and two varieties of beans, Tendergreen and Bountiful, were grown in various areas in Florida. Three fertilizer levels were used— $\frac{1}{2}$ normal, normal, and $1\frac{1}{2}$ normal for the particular crop and area, and eight important soil types were included.

Results showed that the head size of the cabbages varied in proportion to the three levels of fertilizer used—Early Jersey Wakefield averaging 1.2, 1.4, and 1.5 lb. and Copenhagen Market averaging 1.7, 1.9, and 2.2 lb., respectively. The percentage dry weights of both cabbages and beans were markedly affected by differences in locality and to a slight degree by varietal differences. Under parallel soil conditions, Early Jersey Wakefield averaged higher than Copenhagen Market, and Tender-

green higher than Bountiful. The ascorbic acid levels in cabbage tended somewhat to parallel the dry weights. Neither varietal differences nor fertilizer levels appreciably affected the ascorbic acid content of both varieties of cabbage, which averaged 54 mg/100 gm. fresh weight.

Varietal differences were more pronounced in the beans—Tendergreen showing lower ascorbic acid values and higher carotene values than Bountiful (16.0 v. 18.9 mg. and 411 v. 357 $\mu\text{g.}$, respectively). Fertilizer level had little effect on the vitamin values in beans.

Differences in stability of thiamin, riboflavin, and ascorbic acid in cabbage varieties. C. F. POOLE, P. H. HEINZE, J. E. WELCH, and P. C. GRIMBALL. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 45 (1944), pp. 396-404).—A study was made of the influence of variety and breeding lines, cooking and storage, dehydration, and seasonal variation on the relative abundance and interrelationships of ascorbic acid, thiamine, and riboflavin in cabbage. Seven varieties were tested: (1) Round Head No. 18; (2) Copenhagen Market; (3) Marion Market; (4) Volga-1; (5) Volga-2; (6) Charleston Wakefield; and (7) Charleston Wakefield-1. Heads of (1), (5), and (7) were sampled on three different harvesting dates, examined fresh, and after 1 or 2 weeks' storage in the refrigerator or at room temperature. Ascorbic acid assays were made on the raw and cooked samples. For the cooking tests, 50-gm. aliquots were placed in 400-cc. beakers with 50 cc. of water and boiled for 30 min. or for 2 hr. In the latter case, additional amounts of water were needed. Results showed that storage at room temperature or in the refrigerator caused losses of ascorbic acid of around 11 percent. Boiling for 30 min. produced a 53.4 percent loss, while boiling for 2 hr. produced 85.9 percent destruction of ascorbic acid.

All seven varieties were tested fresh, (1) immediately after dehydration, and (2) after 3 months' storage. Results showed an average of 84.2 and 90.4 percent loss of ascorbic acid; 29.9 and 38.2 percent loss of thiamine; and an apparent increase in riboflavin of 43.4 and 66.7 percent for (1) and (2), respectively.

Individual strains showed considerable variation in their initial vitamin content—Copenhagen Market and Round Head No. 18 ranked lowest in all three vitamins under all conditions of the test, while the Volga and the Charleston Wakefield varieties ranked considerably higher, particularly in riboflavin content.

Some seasonal differences were observed—thiamine being generally higher in the cabbages harvested in June, while ascorbic acid ran higher in the heads harvested in February.

Vitamin A content of palm oils. C. F. POE and H. A. FEHLMANN (*Food Res.*, 9 (1944), No. 6, pp. 500-504, illus. 2).—Thirty-two samples of crude palm oil and 7 samples of refined palm oil, from various sources, were assayed for vitamin A. The results showed an average of 132.5 units per gram for the crude oils, but varied widely ranging from 12.3 to 419.4 units. With one exception (233.4 units), all refined oil samples averaged under 100 units per gram—the lowest figure being 0.6 unit. No correlation was apparent between the source of the crude oil and the effects of the refining process.

A chromatographic investigation of the carotenoid pigments of the avocado. S. LASSEN, K. BACON, and J. SUTHERLAND (*Food Res.*, 9 (1944), No. 6, pp. 427-433, illus. 3).—Carotene assays on the Fuerte and Nabal varieties of avocado, respectively, gave the following results: Crude carotene, 2.27-2.36 and 2.35 $\mu\text{g./gm.}$; β -carotene 0.54 and 0.40 $\mu\text{g./gm.}$; and α -carotene, 0.06 and 0.02 $\mu\text{g./gm.}$ An unknown carotene was found, and the spectrophotometric transmission curve is presented. Three unknown pigments were also separated from the avocado and their transmission curves were determined.

Liver reserves of vitamin A and their relation to the signs of vitamin A deficiency in the albino rat. E. C. CALLISON and V. H. KNOWLES. (U. S. D. A.).

(*Amer. Jour. Physiol.*, 143 (1945), No. 3, pp. 444-452).—Weanling albino rats were placed on a vitamin A-free diet supplemented with 10, 15, 20, 30, 50, or 80 units of vitamin A per kilogram body weight per day. In rats of both sexes, growth was inhibited at the two lowest levels.

The scotopic visual threshold of the albino rats was determined by a brightness discrimination test. For normal animals, the threshold lay between 2.6 to 3.5 μ lamberts, while in the deficient (hemeralopic) animals, it generally ranged from 3.9 to 4.7 μ lamberts. Hemeralopia appeared as the first sign of vitamin A deficiency, closely followed by continuous cornification of the vaginal contents of the female.

Tests on the 20-, 30-, 50-, and 80-unit levels of vitamin A intake showed at all levels greater liver storage of vitamin A in the female than in the male, however only at the 80-unit level could appreciable amounts of vitamin A in the liver be demonstrated. Although liver stores on the three lower levels were negligible, subsequent depletion periods (leading to the appearance of hemeralopia) were roughly proportional to the previous vitamin A intake. From this, the authors assume that "some considerable need of the body must be met in an apparently normal animal before liver storage occurs. It also appears as a possibility that more sensitive physiological indicators of vitamin A deficiency remain to be discovered, and that the 'minimum' vitamin A requirement may be somewhat higher than 20 units per kilogram body weight per day."

Vitamin B complex studies on the California avocado, S. LASSEN, K. BACON, and E. HINDERER (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 10, p. 688).—Determination of riboflavin, pantothenic acid, niacin, and biotin were carried out by microbiological methods. Riboflavin was also assayed by the rat-growth method. Tabulated comparisons with the vitamins in other fruits and vegetables indicate that the avocado is a good source of the vitamins tested—the niacin value being particularly high. Results in micrograms per gram of the edible portion showed for riboflavin 1.5, pantothenic acid 2.5, niacin 11.3, and biotin 0.10.

Acute and chronic biotin deficiencies in the monkey (*Macaca mulatta*), H. A. WAISMAN, K. B. MCCALL, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 29 (1945), No. 1, pp. 1-11, illus. 3).—In elaborating upon their previous studies (E. S. R., 91, pp. 772, 773), the authors have produced biotin deficiency in monkeys by three methods: (1) Limiting the biotin intake over long periods, (2) including egg white in a complete diet, and (3) adding a sulfonamide drug to an adequate diet.

The chronic biotin deficiency induced by (1) produced a thinning of the fur coat and a gradual loss of color in the hair. The length of time required to produce these changes could be correlated with the biotin content of the diet. The hair loss was independent of the season, but seemed affected by hormonal influences. Acute biotin deficiencies caused by diets (2) and (3) were strikingly similar. Heavy scaly dermatitis appeared—being most conspicuous on the face, arms, and legs, but covering the whole body in the later stages of the deficiency. Twenty μ g. of biotin per day were sufficient to cure or prevent the chronic symptoms caused by (1) or overcome the deleterious effects of (2) or (3).

The intermediary metabolism of tryptophane in pyridoxine-deficient rats, D. F. REID, S. LEPKOVSKY, D. BONNER, and E. L. TATUM. (Univ. Calif. et al.). (*Jour. Biol. Chem.*, 155 (1944), No. 1, pp. 299-303).—Rats were fed a pyridoxine-deficient diet for 2½-3 weeks until their urine gave a green color when ferric ammonium sulfate was added, this being considered indicative of xanthurenic acid in the urine. The rats then were placed on a pyridoxine- and tryptophan-deficient diet until the green color test was negative. The following compounds were fed in an effort to replace *l*(-)-tryptophan as the precursor of xanthurenic acid: Indole, *dl*-serine, indole-3-propionic acid, indole-3-acetic acid, indole-3-pyruvic acid,

d(+)-tryptophan, abrine, kynurenic acid, and kynurenine. Duplicate tests were made. If results were negative, *l*(—)-tryptophan was fed with or without the addition of pyridoxine.

Of the substances tested, only *l*(—)-tryptophan and kynurenine yielded xanthurenic acid in the pyridoxine-deficient rat. Xanthurenic acid passed unchanged through the pyridoxine-deficient rat, but could not be recovered from the urine of the pyridoxine-fed rat.

Production of riboflavin deficiency with phenazine analogues of riboflavin. D. W. WOOLLEY (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 31-37).—The synthesis of a structural analogue of riboflavin, 2,4-diamino-7,8-dimethyl-10-ribityl-5,10-dihydrophenazine is described briefly. This compound (diaminophenazine) and the reduced form of the dinitrophenazine from which it is derived were found to inhibit the growth of *Lactobacillus casei*, *L. arabinosus*, and hemolytic streptococcus H69D, when normal amounts of riboflavin were added to the growth medium. A considerable excess of riboflavin was needed to counteract the inhibitory effects of these compounds. In mice, a mild riboflavin deficiency was likewise produced with the dinitrophenazine derivative, which could be overcome by sufficient additional amounts of riboflavin.

Interrelationship between thiamine and riboflavin in the liver. H. O. SINGHER, C. J. KENSLEY, H. LEVY, E. POORE, C. P. RHOADS, and K. UNNA (*Jour. Biol. Chem.*, 154 (1944), No. 1, pp. 69-77).—"In young rats depletion in thiamine was found to increase the concentration of riboflavin in the liver above that of control animals. In riboflavin deficiency, the thiamine concentration of the liver was higher than in control animals.

"The concentrations of thiamine and riboflavin in the liver of rats deficient in pyridoxine, in pantothenic acid, in biotin, or in vitamin A were not significantly different from those of litter mate controls maintained on adequate amounts of these vitamins. . . .

"Thiamine-deficient rats had more riboflavin available than the controls, and the feeding with thiamine resulted in a dispersal of the excess riboflavin from the liver. . . . The results are interpreted as evidence of an interdependence of thiamine and riboflavin."

Vitamin interrelationships.—IV. Further studies on the influence of chronic thiamine deficiency on riboflavin metabolism. B. SURE. (Ark. Expt. Sta.). (*Jour. Biol. Chem.*, 157 (1945), No. 2, pp. 543-549).—Continuing the series noted previously (E. S. R., 93, p. 229), the author, with the technical assistance of L. Easterling, has assayed the riboflavin content of various rat tissues. Contrary to the conclusions of Singher et al. (see above), the author concludes "chronic thiamine deficiency produces no noteworthy differences in riboflavin content of body tissues nor in riboflavin absorption compared with those found in control rats. . . . There is poorer utilization of riboflavin in chronic thiamine deficiency than in control rats on isocaloric diets, receiving the same intake of riboflavin, but the poorer utilization is not as great as in acute vitamin B₁ deficiency."

A critique of values suggested as the thiamin requirement of man. D. MELNICK (*Jour. Amer. Dietet. Assoc.*, 20 (1944), No. 8, pp. 516-520).—A summary and critical appraisal of seven recent articles on thiamine requirements are presented. The data are tabulated in terms of minimal requirement and recommended intake, and an attempt to reconcile the findings of the various investigators has been made. The author estimates, on the basis of the studies reviewed, that the minimal thiamine requirement for a sedentary adult is approximately 0.35 mg. per 1,000 calories, and that the N. R. C. recommended intake of 0.6 mg./1,000 calories offers a liberal but necessary margin of safety.

Diurnal and seasonal changes in the ascorbic acid content of some vegetables, H. PLATENIUS. (Cornell Univ.). (*Plant Physiol.*, 20 (1945), No. 1, pp. 98-105, illus. 3).—Tests were carried out to determine whether diurnal fluctuations in light, temperature, and other conditions had any significant effect on the vitamin C content of vegetables. Snap beans, sprouting broccoli, cauliflower, kale, spinach, and Swiss chard were used. Ascorbic acid values were calculated on a dry-weight basis to correct for changes in water content occurring during the night. Under the experimental field conditions used, no consistent differences in vitamin C content could be found to be attributable to diurnal fluctuation or single days of cloudy or sunny weather.

In samples of kale tested over a period of 3 mo. (July 29 to October 26), a 20 percent decrease in vitamin C content was observed. During this same period, the total daily radiation decreased about 76 percent. The author suggests that a corresponding drop in average temperature (which seems to cause a rise in ascorbic acid values) counteracted in part the adverse effect of lowered light intensity.

Ascorbic acid content of tomato varieties, F. J. H. LE RICHE (*Farming in So. Africa*, 20 (1945), No. 227, pp. 105-110).—Thirty-five varieties of tomatoes grown under similar soil and cultural conditions were tested for vitamin C. Fresh, dehydrated, and canned samples were assayed. Considerable varietal difference was found to exist, ascorbic acid values ranging, with one exception, from 11 to 27 mg./100 cc. of fresh juice; the average value being somewhat under 20 mg./100 cc. Identical varieties, obtained from different seed sources, also showed fairly wide differences in their ascorbic acid content—Marglobe (Ford) 26 mg./100 cc., Marglobe (Starke) 15 mg./100 cc. Relatively small variations were found in the vitamin C assays made with similar varieties using hard-green or firm-ripe fruit.

Dehydration studies were made with unblanched tomato slices. The procedure used was not recommended, as ascorbic acid losses, ranging from 40 to 90 percent, averaged 76.6 percent. Peeled tomatoes which had been canned and assayed after 6 months' storage showed an average ascorbic acid loss of 38 percent.

Factors causing the loss of ascorbic acid during the manufacture of tomato juice (*New York State Sta. Rpt.* 1945, p. 25).—A study of tomato juices as processed in two commercial canning plants showed that the over-all loss in the preparation of the final product ranged from 15 to 20 percent. The greatest single loss occurred during the "breaking" of the tomatoes in the preheating process. Excessive holding of the hot juices in an open tank caused considerable loss, but little loss occurred during processing in the can.

Ascorbic acid content of small fruits in relation to genetic and environmental factors, E. HANSEN and G. F. WALDO. (Oreg. Expt. Sta.). (*Food Res.*, 9 (1944), No. 6, pp. 453-461, illus. 1).—"A study has been made of the variability in the ascorbic acid content of small-fruit varieties and selections grown in Oregon. The range in milligrams of ascorbic acid per 100 grams of fresh fruit was 52.6 to 107.1 for strawberry, 17.7 to 37.5 for red raspberry, and 12.1 to 27.5 for blackberry and dewberry varieties and selections. Certain of the selections originated by breeding were found to contain more ascorbic acid than the commercially grown varieties.

"High ascorbic acid potency in the strawberry selections appeared to have been influenced more by Marshall, Clark, Progressive, and *F. chiloensis* than by other varieties or species used in breeding. In red raspberries the selections highest in ascorbic acid content originated from crosses of Lloyd George (low potency) with Chief, Newburgh, or Ranere (intermediate to high potency). The highest ranking blackberry selections were progeny of a cross between Zeilinski and Logan. Both of these varieties are high in ascorbic acid content.

"The ascorbic acid values for individual varieties and selections varied during the harvest season. These variations appear to be related to differences in the climatic

conditions prevailing during the period of growth and ripening. In some varieties of blackberries there was a decrease in ascorbic acid content as the season advanced. Strawberries grown on several different plots, with one exception, showed close agreement in ascorbic acid content."

Experiments were also made to show the influence of shading the fruit or the whole plant. Results showed that the strawberries and raspberries grown or ripened under reduced light intensity contained less ascorbic acid than when fully exposed to light.

Guava—new vitamin C material, J. GODSTON and M. CHANIN (*Food Indus.*, 17 (1945), No. 4, pp. 74-77, illus. 9).—Tests showed that the vitamin C content was remarkably stable in both the raw and the cooked guavas. "When combined with strawberries, blackberries, loganberries, grapes, pineapple, plums, or raspberries, which are average in pectin and acid content, guava will help substantially to raise the level of these properties." Selection of varieties which are superior in taste and nutrient value is emphasized as a necessary step in processing guavas. Processing procedure and formulas are given for guava jam (including pineapple, cherry, or peach combinations), jelly, candy, guava-orange marmalade, guava extract, and sirup.

Adding ascorbic acid to peaches before freezing, J. C. BAUERNFEIND and G. F. SIEMERS (*Food Indus.*, 17 (1945), No. 7, pp. 79-80).—A method for preparing freestone peaches prior to freezing is given in which, at a temperature of 180° to 210° F., the peaches were immersed in a 1 to 2.5 percent lye solution for 45 to 60 sec. The fruit was thoroughly washed (or dipped in a dilute solution of acid) before pitting and slicing.

Suggestions are made for submerging the peaches in a 2 percent citric acid solution if holding is necessary. It is recommended that ascorbic acid be added to the sugar sirup at the minimum rate of 150 mg. per pound of finished pack (fruit plus sugar sirup). This holds when filling packages at the rate of 3 parts of sliced fruit plus 1 part of sugar sirup (by weight) or when filling packages at the rate of 4 parts of sliced fruit plus 1 part of sugar sirup.

Retention of ascorbic acid is brought about by avoiding overheating and over-agitating the sugar sirups. An iodine-titration method for determining the amount of ascorbic acid added to the sirup is outlined. Packaging directions include pressing all of the air out of the inner bag after the addition of the prechilled sirup.

Loss of added vitamin C in the storage of frozen peaches, C. W. DUBOIS and D. L. COLVIN. (La. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr.*, 25 (1945), No. 4, pp. 101-103).—The results of preparation procedures and use of sugars on the retention of ascorbic acid added to peaches prior to storage are reported. Elberta peaches of similar ripeness were subjected to the following treatments: (1) Steam blanched, packed in invert sugar; (2) steam blanched, packed in cane sugar sirup; (3) lye peeled, neutralized in citric acid, and packed in cane sugar sirup; (4) steam blanched, packed in third-run cane sirup; (5) lye peeled, washed with water, covered with cane sugar sirup; and (6) steam blanched, packed in cane sugar sirup, and stored at temperatures fluctuating between 5° and -5° F. Each package contained 300 gm. of peaches, 100 gm. of 50° sirup, and 0.25 gm. of ascorbic acid (dissolved in sirup). With the exception of treatment No. 6, all samples were stored at 0°. Working at this temperature, the samples were ground, mixed, weighed, and placed in beakers containing metaphosphoric acid. After removing from storage, the samples were macerated in a Waring blender, transferred to a 250 cc. volumetric flask, centrifuged, and then titrated against a standardized dye solution. Results, shown in table form, indicate the effect of sugar, peeling method, and storage conditions on the ascorbic acid retention. Fifty percent of the original ascorbic acid was lost during storage at 5° and -5°, while only 32 percent was lost at constant temperature storage. It is pointed out that lye-peeled

peaches should be immediately immersed in citric acid or thoroughly washed with water to insure the effectiveness of the ascorbic acid.

Investigación de la riqueza en ácido ascórbico (vitamina C) en las hojas de diversas especies de citrus cultivadas en el departamento de Montevideo [A study of the ascorbic acid content of the leaves of various citrus species cultivated in Montevideo], A. GOROSTIAGA and R. FERREYRA GUERREROS (*Univ. Repub. [Montevideo], Rev. Facult. Agron., No. 36 (1944), pp. 113-126, illus. 2*).—Ascorbic acid assays were made, by a modification of the method of Tillmans, on the leaves of the following citrus varieties: Orange, mandarin, pomelo, grapefruit, lemon, lime, bergamot, and kumquat. Data are presented giving soil composition and monthly variations in mean temperature, rainfall, and sunlight in the areas tested. Monthly assays were made from January through September. Young buds and mature leaves, on young or adult trees, were obtained from the north or south side of the tree. The fresh leaves gave ascorbic acid values ranging from an average of 39 mg. percent in the mandarin leaves to 91 mg. percent in the lemon leaves. Lowest ascorbic acid values were usually found in the leaves picked in January—highest values occurring generally in April or May. The young leaves or buds often contained twice as much ascorbic acid as mature leaves from the same tree. Leaves taken from the north side of the tree were generally considerably richer in ascorbic acid than those obtained from the south side.

The leaves were air dried in the sun or in the shade for 8 days, or dehydrated in an oven at 30°–35° C. or 70°–75°. Best ascorbic acid retention was obtained in the air-dried leaves—those dried in the shade averaging somewhat higher than those dried in the sun.

By adding 5 gm. of the dried leaves to 100 cc. boiling water, an agreeable and tasty beverage could be made. If young, dried orange or lemon leaves high in ascorbic acid were used, the resulting beverage could contain from 20.8 to 30.8 mg. ascorbic acid per 100 cc.

The ascorbic acid content of freshly prepared and of stored orange marmalade, M. L. JOHNSON, F. I. SCULAR, and D. F. BURT (*Jour. Amer. Dietet. Assoc., 20 (1944), No. 10, pp. 668-670*).—Experimental home-made orange marmalades were prepared containing variable proportions of orange, sugar, and lemon with or without added pectin. Samples were assayed before cooking and 24 hr., 15 days, and 6 mo. after preparation. Comparisons were made with commercial marmalades and other home-made samples.

The tabulated results showed considerable loss of ascorbic acid in the cooking period, ranging from 46 to 84 percent. Some additional loss occurred after 15 days' storage at room temperature, whereas, the overall loss after 6 mo. amounted to 97 to 99 percent. Tabulated results indicated that without the addition of pectin during the preparation, the final stored product contained less than 1 mg. percent ascorbic acid. With pectin, the highest value obtained (after 6 months' storage) was 2.7 mg. percent ascorbic acid. Values for commercial and other home-made marmalades ranged from 1.05 to 9.97 mg. percent.

TEXTILES AND CLOTHING

Properties of synthetic fibers—key to proper use and potentialities, C. W. BENDIGO and W. B. DALL (*Textile World, 95 (1945), No. 9, pp. 117-132, illus. 22*).—Listing the properties of all commercial yarns available, this tabulation is a revision of charts appearing in 1939 and 1943. A reconversion program from war to peacetime production is reviewed. Experimental yarns, including rayon variations, protein fibers (from peanut-protein, keratin, albumin, hides, hoofs, tendons, or other animal matter), and non-cellulosic fibers are not listed on the chart, but some of their general characteristics are indicated in a summary.

Some factors contributing to the felting of wool, M. HARRIS (*Amer. Dyestuff Rptr.*, 34 (1945), No. 4, pp. 72-75, illus. 2).—Felting and the rate of felting are influenced by many factors, and among those listed in the literature (37 references) are fiber fineness, length, scaliness, swelling, fiber migration, temperature, pH, previous chemical treatment, crimp, wet strength, extensibility or rigidity, recovery from extension, yarn structure, fabric structure, etc. "It is apparent, therefore, that shrink resistance might be accomplished by affecting one or more of the various factors that contribute to the felting mechanism." The author suggests that one approach to the problem would be "to alter the relative mechanical properties of cortex and cuticle, either by sufficiently weakening or strengthening either phase so that the normal 'curling tendency' of the fiber is minimized."

Physical measurements on chicken feathers.—I, Compression tests, J. S. LEE, A. M. REEVES, and G. F. STEWART. (Iowa Expt. Sta.). (*Amer. Dyestuff Rptr.*, 34 (1945), No. 20, pp. 377-382, illus. 8).—"The data for this study were obtained from compression-recovery tests on 10 feather specimens composed of 23 samples. Tests were performed at stated periods with alternating intervals of rest. Compression, recovery, permanent deformation, filling capacity, and weight per unit volume of downy contour feathers by length, cut barbs by length, stripped barbs, duck down, and goose down were determined.

"Chicken feathers, in general, increased in compressibility and in percent instantaneous recovery with a decrease in particle size of the material. The tendency of the barbs of the goose down and duck down to mat or felt seemed to be the cause of their resistance to compression and recovery.

"The loss in percent recovery of down and feathers was small over the range of pressures used except in the case of the stripped barbs. The recovery of feathers and cut barbs increased with length and increased with pressure within the limits of the pressures used in this study. The downy contour feathers, in general, showed the most recovery, and the cut barbs the least. Goose down and duck down were low in percent recovery because of their tendency to mat or felt.

"Permanent deformation, as measured by the loss of recovery, increased as feathers got shorter and was most evident in the stripped barbs, which showed a loss in percent recovery and a loss of filling capacity. Both the goose down and the duck down exhibited high filling capacity after compression, and therefore showed little or no measurable permanent deformation.

"The weight of feathers per unit volume was found to increase in the following order: Duck down, goose down, cut barbs, stripped barbs, and downy contour feathers."

Laboratory cutter for cloth strips, J. H. KETTERING and A. S. COOPER. (U. S. D. A.). (*Amer. Dyestuff Rptr.*, 34 (1945), No. 13, p. 249, illus. 2).—A device for cutting cloth strips into desired widths and winding them into rolls is described here. The cutting is accomplished by a series of household electric scissors which operate by a vibration mechanism. It is estimated that this device, which is simple to operate, will handle 80 to 100 yd. an hour.

The importance of standard test methods, ratings, and terminology for color fastness, H. A. EHRMAN (*Amer. Dyestuff Rptr.*, 34 (1945), No. 13, pp. P255-P256).—The author points out that the trade is in agreement with the recognized need for ratings to evaluate test results of every type of fiber, weave, pattern, or dyestuff. A single system of terminology for these ratings (words, symbols, letters, or numbers) should supplement specific methods of test and should result in additional demand for improved correlation between test methods and end uses.

Observations on the growth of some copper-tolerant fungi on cotton fabrics, C. H. BAYLEY and M. W. WEATHERBURN (*Amer. Dyestuff Rptr.*, 34 (1945), No. 13, pp. 247-248).—"Qualitative observations on their growth on light cotton fabric

containing copper naphthenate indicate that *Chaetomium globosum* and *Metarrhizium* are completely inhibited by contents of 0.3 percent and 0.5 percent copper as copper naphthenate, respectively, whereas the growth of *Aspergillus niger* is not inhibited over the whole range (0.005 percent to 0.8 percent) of copper content investigated.

"A potent cellulose-destroying species of *Penicillium* isolated from the soil has been shown to grow readily on samples of cotton fabric containing 0.3 percent copper both with and without wax. The activity of this organism and also that of *A. niger* is inhibited by the presence of 0.3 percent copper in the form of copper naphthenate plus 0.1 percent of mercury in the form of mercuric naphthenate."

HOME MANAGEMENT AND EQUIPMENT

Time expenditures in homemaking activities by white and Negro town families. D. DICKINS (*Mississippi Sta. Bul. 424 (1945), pp. 26, illus. 7*).—Time expenditures in homemaking activities of 80 Negro and 80 white town families of Mississippi were analyzed by methods worked out by the U. S. D. A. Bureau of Human Nutrition and Home Economics. Each homemaker was asked to keep a record of activities and assistance in homemaking activities for 1 week. White and Negro home economics teachers supervised these records.

Analysis of the records showed that "more time was spent by all groups in food homemaking than all other homemaking activities combined. More than half of the time spent in food homemaking activities (preparing all meals, clearing away all meals, refreshments for social affairs, preservation of food, food purchasing and planning) was spent in preparing meals.

"Laundering was the 'other homemaking activity' that consumed the most time of Negro homemakers. Daily and weekly cleaning took more of the time of the white cooperator. The majority of white women either hired a woman to assist in laundry work or sent clothing and household textiles away from home to be laundered. White homemakers in families of \$20.00 and under housing spent more time in care of members than they did in any 'other homemaking activity.' This was because more homemakers in this group had children of 5 yr. and under. Homemakers with children 5 yr. and under averaged about 12 hr. a week in care of these children.

"Fifty-three percent of the Negro homemakers and 29 percent of the white homemakers spent some time in gainful activities during the study week. . . .

"Children were the main source of assistance in homemaking activities to Negro women, while hired help was more important to white women, especially in families with housing of \$20.01 to \$40.00. Husbands in both white and Negro families of lower housing value averaged about twice as much assistance in homemaking activities as those in families of higher housing value. Homemakers of larger families received considerably more assistance in homemaking than homemakers in small families. . . .

"Homemaking was more than a full-time job in the typical family of this study. Thirty percent of the white homemakers and 23 percent of the Negro homemakers averaged more than 56 hr. during the study week, or the equivalent of 8 hr. a day every day in the week in such activities. Time expended in homemaking must be reduced not only for those who are overburdened, but reduced so that women in families of low socioeconomic status can take some time for gainful work. It must be reduced so that more time can be devoted to children, especially to older children."

Where the money went: Changes in family living from 1940 to 1942 in 106 FSA families in Wisconsin. M. L. COWLES, M. M. SIEK, and J. F. MYERS (*Wisconsin Sta. Res. Bul. 155 (1945), pp. 15+, illus. 2*).—"Comparison was made between 1940 and 1942 incomes and expenditures for 106 FSA families in Wisconsin. The increase in gross income was 90.5 percent and in net income 108.4 percent. Expendi-

tures for family living and such savings as life insurance and war bonds went up 71.2 percent, with an increase in every commodity group both in absolute amount spent and on the percentage basis. Allowing for increased living costs, however, the actual increase in family living was only 34.9 percent.

"On a percentage basis, expenditures for four groups—medical care, church, school, and other educational items and personal gifts—showed the greatest gain. Medical care increases were due in part to more expenditure for care of the eyes and teeth and to greater use of hospitalization. In clothing, expansion in percentage spent for outerwear and a corresponding decline in proportion going to footwear was found to accompany the larger total spent.

"The larger the family, the larger was the total expenditure going to food and clothing, and the smaller was the amount and percentage left for other items. The per capita expenditure for food, clothing, and medical care was less, the larger the family.

"Payment on debts, including the farm mortgage, undoubtedly kept down family living expenditures in both 1940 and 1942. Debt payment absorbed more than the amount left from the total income after paying for farm expenses and family living."

REPORTS AND PROCEEDINGS

Highlights of the work of the Mississippi Experiment Station: Fifty-seventh Annual Report for the fiscal year ending June 30, 1944, C. DORMAN. (Partly coop. U. S. D. A.). (*Mississippi Sta. Rpt. 1944, pp. 52, illus. 13*).—This report, previously noted from other sources (E. S. R., 91, p. 784; 92, p. 157), contains results of work with soybean, oat, and barley varieties; lespedeza and clover strains and Johnson grass-sorghum hybrids; pasture fertilizers; hybrid corn; boron for cotton; corn and vetch fertilizers; lime for soybeans and hairy vetch trends in farm land values and land tenure; effect of cotton gin on quality; livestock auctions; cotton soil erosion and root ecology; types of ewes for spring lambs; cottonseed cake and meal for finishing calves and pigs; urea-treated silage and minerals for beef animals; corn, oats, and barley for finishing pigs; vitamin studies with butter, turnip greens, beans, and cooked vegetables; input as related to output in milk production; Johnson grass silage and minerals for dairy cows; food preparation for economic groups; variety studies with peaches and apples; cultural and fertilizer studies with sweet-potatoes; azalea culture; studies of late blight of potatoes; prevention of damping-off in cotton seedlings; control of the root knot and meadow nematodes in garden soil; watermelon and cotton wilt diseases; gas equipment for brooding chicks; vitamin A deficiency in pullets; kudzu for growing chicks; control of cucumber and melon insects and boll weevil; bees and clover seed setting; and results at the substations, including tests of corn hybrids, spacing, and fertilizers; variety tests of corn, sugar cane, oats, barley, wheat, and soybeans; nitrogen for Delta soils; cotton varieties and breeding; control of cotton weeds by flaming and leaf defoliation with calcium cyanamide; varieties of sweet corn, tomatoes, cabbage, peas, peaches, and apples; pasture improvement at Natchez; seed production of crimson clover, wild winter peas, and hop clover; cotton and peanut fertilizers; fertilizers for tung trees, peas, and cabbage; control of cabbage mildew; and miscellaneous diseases.

Sixty-fourth Annual Report of the New York State Agricultural Experiment Station, [1945], A. J. HEINICKE. (Partly coop. U. S. D. A. et al.). (*New York State Sta. Rpt. 1945, pp. 74*).—In addition to work noted elsewhere in this issue, results are reported of studies in bacteriology, including a "T" vitamin factor in tomato juice and other vegetables, liver, and orange juice, the packaging and storage of processed foods, sanitation of canneries and food-handling equipment, tests of quaternary ammonium compounds as disinfectants, preservation of food by fermentation, salting, and freezing, changes in fruit juices on storage, mass production of

spores of *Bacillus popilliae*, role of micro-organisms in nitrogen nutrition of peas, and pre-inoculation of legume seed; chemistry, including factors responsible for vitamin destruction and other changes in processed fruits and vegetables, an adaptation of the xylene-extraction method for ascorbic acid, improved methods for dust applications of fungicides and insecticides, and the chemistry of proteins and allied substances; entomology, including studies of grape leafhoppers, control of Japanese beetle larvae, petroleum oils and DDT as orchard sprays, control of scurfy scale, European red mite, oriental fruit moth on quince, spittle insect on strawberries, grape berry moth, maggots attacking cole crops, cabbage worm, pea aphid, European corn borer, and European chafer; plant pathology, including studies of stunt disease of blueberries, currant leaf spot, control of gooseberry diseases, black rot, powdery mildew and downy mildew of grapes, spur blight of raspberries, apple scab, peach leaf curl, sooty blotch, scab, and leaf spots of pears, tests of new fungicides, seed treatment for canning crops, interrelationship of soil fertility and pea root rot control, control of tomato diseases, cabbage yellows, downy mildew and other diseases of hops, and the hop vine borer, sprays and dusts for lima beans, production of disease-free second crop seed potatoes on Long Island, and studies of *Fusarium* seed-piece decay; pomology, including notes on varieties of apples, cherries, peaches, plums, grapes, currants, raspberries, and strawberries, fertilizers for apples, soil modification for blueberries, cherry culture, and rootstocks for apples and cherries; seed investigations, including germination of peaches and sweet peas and other flowers, and seed-borne micro-organisms; and vegetable crops, including nitrogen fertilizers v. inoculation of peas, starter solutions for tomatoes, and transplanting methods and soil amendments for beets.

MISCELLANEOUS

Mississippi Farm Research [November-December 1945] (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1945), Nos. 11, pp. 8, illus. 5; 12, pp. 8, illus. 7).—In addition to articles noted elsewhere in this issue and weather notes, No. 11 contains Agricultural Prices and the National Income, by F. J. Welch and H. P. Todd (pp. 1, 8); Spray Now to Guard Trees Against Scale, by C. Lyle (p. 1); and Production and Utilization of Silage in Mississippi, by H. W. Bennett, R. H. Means, W. C. Cowser, O. A. Leonard, and M. Gieger (pp. 1, 3-6, 7), also to be issued as a station bulletin. No. 12 also contains Fertilizer Recommendations in Mississippi, 1946, by C. Dorman (pp. 1, 3, 4-6), also to be issued as a station bulletin; Methods Used in Producing Tomato Plants for Spring Crop Listed by Truck Substation, by J. A. Campbell and H. H. Foster (p. 2); Cotton Varieties at Hill Stations, 1945, by J. F. O'Kelly (pp. 5, 6); and Fewer but Larger Mississippi Farms, by H. P. Todd (p. 12).

Farm Research [January 1, 1946] (*Farm Res. [New York State and Cornell Stas.]*, 12 (1946), No. 1, pp. 20, illus. 11).—In addition to articles noted elsewhere in this issue, this number contains New Germicides for Food Processors, by G. J. Hucker (pp. 1-2), in which the quarternary ammonium compounds are discussed on the basis of station studies; New York's 1945 Hop Crop Below Normal, by J. D. Harlan (pp. 9-10); Study Shows Good Keeping Quality of Pasteurized Milk, by A. C. Dahlberg (pp. 17, 19), based on work previously noted (E. S. R., 94, p. 375); and How "2,4 D" Kills Weeds (p. 20).

Bi-monthly Bulletin [November-December 1945] (*North Dakota Sta. Bim. Bul.*, 8 (1945), No. 2, pp. 31).—In addition to articles noted elsewhere in this issue, this number contains Artificial Light for Turkey Breeding Hens—A Review, by J. E. Parker (p. 6); How Plants and Animals Get Their Names, by O. A. Stevens (pp. 9-13); Diseases of North Dakota Poultry, by J. O. Foss (pp. 17-19); Land Market Activity in North Dakota, Third Quarter 1945, by J. W. Porter and R. Engelking (pp. 26-29) (coop. U. S. D. A.); and North Dakota Farm Prices [as of October 15, 1945], by P. V. Hemphill (pp. 29-31).

NOTES

Georgia University.—Appointments since January 1 include Edwin Kenney in landscape architecture, Joel E. Giddens and Dr. Mattias Stelly in agronomy, Dr. Jennings B. Frye, Jr., in dairying, Edmund Hoffman in poultry husbandry, Darrell T. Sullivan in horticulture, J. Van Rogers in agricultural economics, and Wedford J. Liddell, J. W. Simmons, and Drayton T. Kinard in agricultural engineering.

Illinois University and Station.—Dr. Roger P. Link, assistant professor of veterinary physiology in the Kansas College, has been appointed professor of veterinary physiology and pharmacology.

Kansas College and Station.—The veterinary medical hospital was damaged by fire to the extent of \$100,000 to \$125,000 on February 17. All animals and most instruments, drugs, and equipment were saved.

Earl J. Splitter has been appointed professor of veterinary medicine.

Mississippi Station.—A grant of \$100,000 for the development of agricultural research has been authorized by the General Education Board, contingent upon the inauguration of a comprehensive program for expansion of the branch stations under which a minimum of \$212,000 would be secured from other sources for the same purpose. Under the projected plan, the stations at Natchez and Raymond would be discontinued and replaced by consolidation into a comprehensive brown-loam branch station on a 2,200 acre State-owned property at Oakley. A new Upper Coastal Plain Branch Station of 1,500 to 2,000 acres would be established for east-central Mississippi. The work at Poplarville would be expanded by reactivating the McNeill station for forage, pasture, livestock, and forestry research, and that at Holly Springs by the purchase of 500 acres of additional land. A Black Belt or prairie research program for work in pastures, forage crops, and livestock management would be another new development. Additional buildings, laboratories, and other facilities would be provided for the Truck Crops Station at Crystal Springs and the Delta Branch Station at Stoneville.

Dr. Russell Coleman, associate professor of agronomy and associate agronomist, has been appointed associate director of the station.

New York State Station.—Weymouth D. Pew has been appointed assistant in vegetable crops vice Dr. John F. Davis who has accepted a position in soil science at the Michigan College beginning May 1.

Ohio State University and Station.—Dr. Walter R. Krill, professor of veterinary medicine and associate in animal industry, has been appointed dean of the College of Veterinary Medicine.

South Dakota Station.—Two cases of fruit tree cuttings have been donated to Russian Relief and flown by airplane to the Soviet Union where they will be used to help restore orchards destroyed in the Ukrainian and Belorussian Republics. See also a previous note (E. S. R., 94, p. 559).

Texas College.—Dr. R. L. Mundhenk, professor of veterinary anatomy about 1940 and subsequently in commercial work, died January 13 in Colorado. He has also been an instructor in the Ohio State University and professor of anatomy and histology in the Alabama College from about 1937 to 1939.

Wisconsin University and Station.—Dr. E. E. Miller has been appointed physicist in the station, both to conduct research and as a consultant for other departments. He will also do some teaching in the university.

A short course in rural electrification was offered from March 26 to March 28. Dr. William E. Black has been appointed extension specialist in marketing.

National Institute of Agronomy in Dominican Republic.—This institute has been established by presidential decree and will constitute the first agricultural college to be operating in the Republic since the closing of the National Agronomic Station at Moca in 1935. Permanent quarters will be built when a site has been selected, the institute being temporarily housed in San Cristobal, a short distance from Ciudad, Trujillo. Facilities will be provided for training students in science and practical agriculture, and the bachelor's degree will be offered in agricultural science and agricultural engineering.

Agricultural School of Amazonia, Brazil.—Under a presidential decree signed December 5, 1945, this school has been established at Belem, Para. The institution is associated with the Instituto Agronomico do Norte, and has the director of the institute, Dr. Felisberto Camargo, as its head.

Caribbean Research Council.—A recent issue of *Science* contains a note by P. Morales Otero of the Puerto Rico School of Tropical Medicine which summarizes the program of this council, established by the Anglo-American Caribbean Commission in 1943. Its organization has now been completed and includes a technical research committee on agriculture, nutrition, fisheries, and forestry. This committee has been conducting surveys on sugar, livestock, grain crops, root crops and legumes, vegetables, grasses and grassland management, and coconut, copra, and oil seeds. Of these surveys, those on sugar production and livestock are the most advanced. A land-tenure symposium was held in Puerto Rico from August 27 to September 3, 1944, and a forest research meeting in Trinidad January 14–23, 1946.

Report of Committee on Higher Education in England and Wales.—This committee was appointed in 1944 to consider the character and extent of the need for higher agricultural education in England and Wales and to make recommendations as to the facilities which should be provided. Its report has recently been released, and according to a summarized statement stresses the need in the national agricultural advisory service, research, and teaching of a university education supplemented by specialized graduate study. The committee also recommends that the whole system of higher agricultural education should be "tidied up and remodelled" to meet the needs of the future. University departments of agriculture should provide only a degree course of improved standard in agriculture and horticulture, together with the wide range of graduate courses suggested by the committee as a preparation for professional careers. Agricultural colleges should confine themselves to 2-year courses expressly designed for the practical man, and during an experimental period of 8 or 10 years, which will serve to decide the future of this type of education, should be relieved of competition in this particular field from farm institutes. The committee indicates that increased grants from the treasury will be needed to bring about these improvements, and recommends that generous provision should be made for scholarships by both rural and urban education authorities in order to insure that "no man or woman of the requisite ability who wishes to be trained for one or other of the careers" in question shall be prevented by lack of financial resources.

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